MODELS BTP(V)-540A, 650A AND 740A

COMMERCIAL GAS, GLASS-LINED, TANK-TYPE LOW NOx WATER HEATER

• INSTALLATION • OPERATION • MAINTENANCE • LIMITED WARRANTY

CONSERVATIONIST®

WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death.

— Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

— WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

— Installation and service must be performed by a qualified installer, service agency or the gas supplier.

⚠ CAUTION

TEXT PRINTED OR OUTLINED IN RED CONTAINS INFORMATION RELATIVE TO YOUR SAFETY. PLEASE READ THOROUGHLY BEFORE INSTALLING AND USING THIS APPLIANCE.

A.O.SMITH
WATER PRODUCTS COMPANY
A DIVISION OF A.O.SMITH CORPORATION
MCBEE, SOUTH CAROLINA
www.aosmithwaterheaters.com

PLACE THESE INSTRUCTIONS ADJACENT TO HEATER AND NOTIFY OWNER TO KEEP FOR FUTURE REFERENCE.

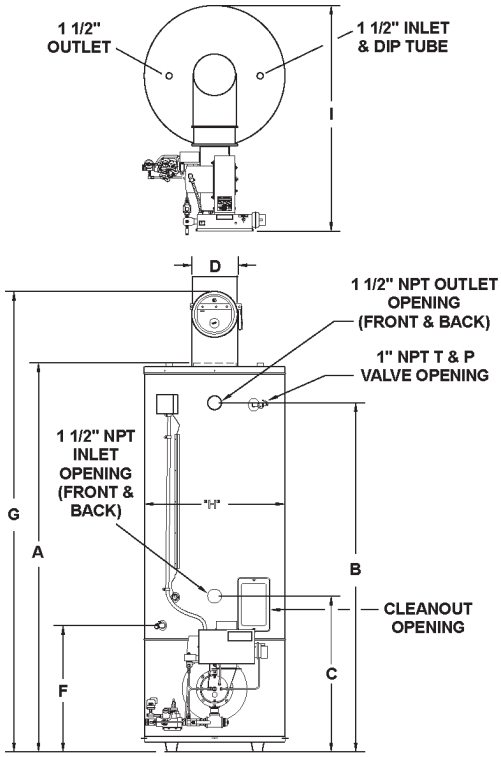
PRINTED IN U.S.A. 1004

PART NO. 195033-000

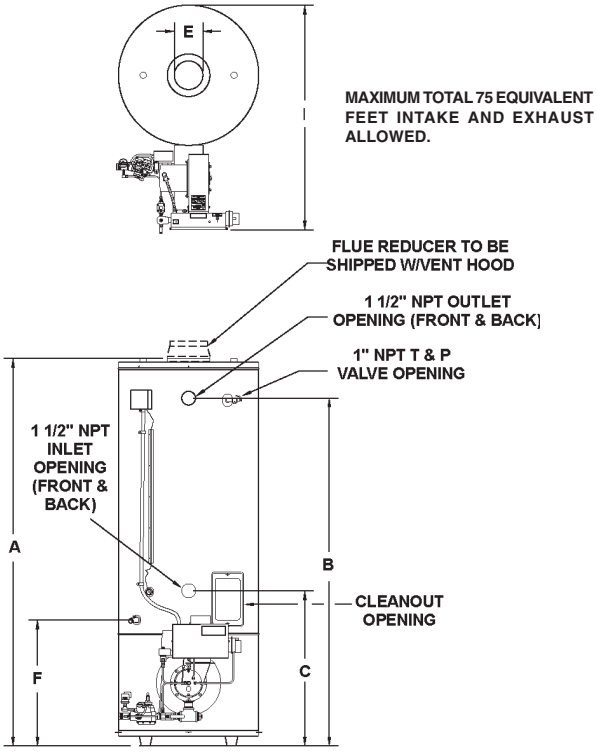
Downloaded from www.Manualslib.com manuals search engine

ROUGH-IN DIMENSIONS

STANDARD BAROMETRIC DRAFT CONTROL
BTP MODELS



HORIZONTAL & DIRECT VENTING
BTPV MODELS



ALL DIMENSIONS IN INCHES (MILLIMETERS)

Models	A	B	C	D	E	F	G	H	I	Gas Conn.	Approx. Ship. Wt.
BTP(V)-540A	80 3/4	73	32 1/4	9	6	26 1/2	93	29 1/2	48 1/2	1*	950
	2,051	1,854	819	229	152	673	2,362	749	1,232	25.4	431 kg
BTP(V)-650A	80 3/4	73	32 1/4	9	8	26 1/2	93	29 1/2	48 1/2	1*	950
	2,051	1,854	819	229	203	673	2,362	749	1,232	25.4	431 kg
BTP(V)-740A	80 3/4	73	32 1/4	9	8	26 1/2	93	29 1/2	48 1/2	1*	950
	2,051	1,854	819	229	203	673	2,362	749	1,232	25.4	431 kg

*Minimum gas supply pipe is 1 1/4", reference Table 7 for gas supply pipe size.

Models	Storage Capacity U.S. Gals. (Litres)	Input Rating BTU/HR. Nat.	Recovery Rating GPH 100°F Rise	Recovery Rating GPH 140°F Rise	Current Draw 120V 60Hz 1 Phase
BTP(V)-540A	85 (261)	540,000	523.6	374	6.0 Amps
BTP(V)-650A	85 (261)	650,000	630	450	
BTP(V)-740A	85 (261)	740,000	718	512	

Based on 80% thermal efficiency obtained in A. O. Smith engineering laboratories.
NOTE: To compensate for the effects of high altitude areas above 2000 feet, recovery ratings should be reduced approximately 4% for every 1000 feet above sea level.

FOREWORD

The design of the BTP 540A through 740A models complies with ANSI Z21.10.3/CSA 4.3 as an automatic circulating tank and an automatic instantaneous type heater. The BTPV 540A through 740A models are designed for sidewall venting and direct venting applications and are certified under UL 795.

Detailed installation diagrams are found in this manual. These diagrams will serve to provide the installer with a reference for the materials and methods of piping necessary. It is highly essential that all water, gas piping and wiring be installed as shown on the diagrams.

Particular attention should be given to the installation of thermometers at the locations indicated on the diagrams, as these are necessary for checking the proper functioning of the heater.

THE HEATER IS DESIGNED TO OPERATE ONLY ON NATURAL GAS.

THESE HEATERS MUST NOT BE INSTALLED ON COMBUSTIBLE FLOORS.

Downloaded from www.Manualslib.com manuals search engine

In addition to these instructions, the equipment shall be installed in accordance with those installation regulations in accordance with those installation regulations in force in the local area where the installation is to be made. These shall be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

In the absence of local codes, the installation must conform with the instructions as outlined in the latest publication of National Fuel Gas Code (NFPA-54/ANSI Z223.1) and National Electric Code (NFPA-70). These manuals can be purchased from the Canadian Standards Association Laboratories, 8501 East Pleasant Valley Road, Cleveland, OH 44131, National Fire Protection Association, 1 Batterymarch Park, Quincy MA 02269.

TABLE OF CONTENTS

	PAGE
ROUGH-IN-DIMENSIONS	2
FOREWORD	2,3
TABLE OF CONTENTS	3
GENERAL SAFETY INFORMATION	3
Precautions	3
Liquid Petroleum Models	3
Chemical Vapor Corrosion	3,4
Improper Combustion	4
EXTENDED NON-USE PERIODS	4
Cathodic Protection	4
Insulation Blankets	4
High Altitude Installations	4
FEATURES	4
Low Emmission Control	4
High Limit Switch (E.C.O.)	4,5
Dishwashing Machine Requirement	5
INSTALLATION INSTRUCTIONS	5
Required Ability	5
Uncrating	5
Locating the Heater	5,6
Hard Water	6
Clearances	6
Air Requirements	6
Venting	6,7
Vertical Venting - For BTP Models	7
Horizontal (Side-wall) Venting - For BTPV Models	7,8
Direct Venting - For BTPV Models	9-11
Gas Piping	11-12
Gas Meter Size	12
Gas Pressure Regulation	12
Gas Valves	12,13
Water Line Connections	13
Thermometers	13
Relief Valve	13
INSTALLATION DIAGRAMS	14-17
Manifold Kits	18
Heater Wiring	19
START UP	19
Important	19
Filling	19
Purging	19
Wiring Diagram	20,21
Lighting and Operating Label	22
Sequence of Operation	23
Water Temperature Control	23
Adjustment Procedure (Initial Start-Up)	23,24
Adjustment Procedure for Fire-Rate, Low Nox and High Elevation (Fine-Tune)	24-26
GENERAL INFORMATION	27
Power Burner	27
Thermostat	27
High Limit	27
MAINTENANCE	27
General	27
Maintenance Schedule	27
Electrical Servicing	27
Flushing	27
Draining	28
Sediment Removal	28
Lime Scale	28
Relief Valve	28,29
Circulating Pump	29
Low Emission Power Burner	29
Cleaning Flues	29
Barometric Draft Control	29
Vent System	29
CHECKLIST AND SERVICE INFORMATION	29-30
TROUBLESHOOTING	30-32
Replacement Parts	32
WARRANTY	33
NOTES	34,35

GENERAL SAFETY INFORMATION

PRECAUTIONS

DO NOT USE THIS APPLIANCE IF ANY PART HAS BEEN UNDER WATER. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

IF THE UNIT IS EXPOSED TO THE FOLLOWING, DO NOT OPERATE HEATER UNTIL ALL CORRECTIVE STEPS HAVE BEEN MADE BY A QUALIFIED SERVICEMAN.

1. EXTERNAL FIRE.
2. DAMAGE.
3. FIRING WITHOUT WATER.
4. SOOTING.

LIQUID PETROLEUM MODELS

⚠ WARNING

Water heaters for propane or liquefied petroleum gas (LPG) are different from natural gas models. A natural gas heater will not function safely on LP gas and no attempt should be made to convert a heater from natural gas to LP gas.

BTP(V)-540A, 650A & 740A models are not available for use with Liquefied Petroleum or LP gas. If you have obtained a BTP(V)-540A, 650A or 740A model with the intent to use it with Liquefied Petroleum, LP gas - STOP! Immediately contact your dealer to obtain a correct model.

CHEMICAL VAPOR CORROSION

⚠ WARNING

CORROSION OF THE FLUEWAYS AND VENT SYSTEM MAY OCCUR IF AIR FOR COMBUSTION CONTAINS CERTAIN CHEMICAL VAPORS. SUCH CORROSION MAY RESULT IN FAILURE AND RISK OF ASPHYXIATION.

Spray can propellants, cleaning solvents, refrigerator and air conditioning refrigerants, swimming pool chemicals, calcium

Downloaded from www.Manualslib.com manuals search engine

and sodium chloride (water softener salt), waxes, and process chemicals are typical compounds which are potentially corrosive. Do not store products of this sort near the heater. Also, air which is brought in contact with the heater should no contain any of these chemicals. If necessary, uncontaminated air should be obtained from remote or outside sources. The limited warranty is voided when failure of water heater is due to a corrosive atmosphere. (Refer to the limited warranty for complete terms and conditions).

IMPROPER COMBUSTION

⚠ WARNING

ATTIC AND OR EXHAUST FANS OPERATING ON THE PREMISES WITH A WATER HEATER CAN RESULT IN CARBON MONOXIDE POISONING AND DEATH.

OPERATION OF THESE FANS CAN PRODUCE A NEGATIVE DRAFT IN THE AREA OF THE WATER HEATER PREVENTING THE PRODUCTS OF COMBUSTION FROM EXHAUSTING THROUGH THE CHIMNEY OR VENT PIPE.

The venting of the water heater should be inspected by a qualified service technician at the time of installation and periodically thereafter to ensure a down-draft condition does not exist.

DO NOT OBSTRUCT THE FLOW OF COMBUSTION AND VENTILATION AIR, ADEQUATE AIR FOR COMBUSTION AND VENTILATION MUST BE PROVIDED FOR SAFE OPERATION.

EXTENDED NON-USE PERIODS

CATHODIC PROTECTION

⚠ CAUTION

HYDROGEN GAS CAN BE PRODUCED IN A HOT WATER SYSTEM SERVED BY THIS HEATER THAT HAS NOT BEEN USED FOR A LONG PERIOD OF TIME (GENERALLY TWO WEEKS OR MORE). HYDROGEN GAS IS EXTREMELY FLAMMABLE. To reduce the risk of injury under these conditions, it is recommended that a hot water faucet be opened for several minutes before using any electrical appliance connected to the hot water system. If hydrogen is present, there will probably be an unusual sound such as air escaping through the pipe as the water begins to flow. **There should be not smoking or open flame near the faucet at the time it is open.**

INSULATION BLANKETS

⚠ WARNING

INSULATION BLANKET AVAILABLE TO THE GENERAL PUBLIC FOR EXTERNAL USE ON GAS WATER HEATERS ARE NOT APPROVED FOR USE ON YOUR A.O. SMITH WATER HEATER. THE PURPOSE OF AN INSULATION BLANKET IS TO REDUCE THE STANDBY HEAT LOSS ENCOUNTERED WITH STORAGE TANK WATER HEATER. YOUR A.O. SMITH WATER HEATER MEETS OR EXCEEDS THE ASHRAE/IES 90.1B 2001 STANDARDS WITH RESPECT TO INSULATION AND STANDBY LOSS REQUIREMENTS, MAKING AN INSULATION BLANKET UNNECESSARY. THE USE OF INSULATION BLANKETS IN CONJUNCTION WITH AN A.O. SMITH WATER HEATER WILL ALSO VOID THE SMITH WARRANTY FOR THE FOLLOWING REASONS:

1. **INSULATION BLANKETS COVER IMPORTANT OPERATING INSTRUCTIONS AND SAFETY LABELS.**
2. **INSULATION BLANKETS CAN RESTRICT THE AIR FLOW NEEDED FOR PROPER OPERATION OF THE COMBUSTION SYSTEM AND COULD RESULT IN FIRE, ASPHYXIATION, SERIOUS PERSONAL INJURY OR DEATH.**

⚠ WARNING

FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

HIGH ALTITUDE INSTALLATIONS

Your A.O. Smith water heater has been designed to operate at altitudes below 2000 Ft. (609.6 m), for appliance installation locations with elevations above 2000 Ft. (609.6 m), special considerations need to be taken. Adjustments for high altitude can only be made by an A.O. Smith authorized BTP Start-up Agent. To ensure your water heater operates properly at high elevation, an A.O. Smith authorized BTP Start-up Agent will readjust the air-intake damper setting and the gas manifold pressure (if required).

NOTE: Some gas utility companies derate the heating value of the supplied gas at high elevation. Your authorized start-up agent must adjust for actual heating value of the gas at the time of start up.

FEATURES

LOW EMISSION CONTROL

Your A.O. Smith water heater has been designed to comply with standards established by California South Coast Air Quality Management District (SCAQMD), the most stringent emissions control agency in the nation. To ensure compliance with SCAQMD Rule 1146.2, your heater is equipped with an internal recirculation premix power burner, and must be started/adjusted by an A.O. Smith Authorized BTP Start-Up Agent.

HIGH LIMIT SWITCH (E.C.O.)

The dual bulb controller also contains the high limit (energy cutoff) sensor. The high limit switch interrupts main burner gas flow should the water temperature reach 205°F (96°C).

In the event of high limit switch operation, the appliance cannot be restarted unless the water temperature is reduced by 20°F (11°C) approx. and the high limit reset button on front of limit control is depressed, see Figure 1.

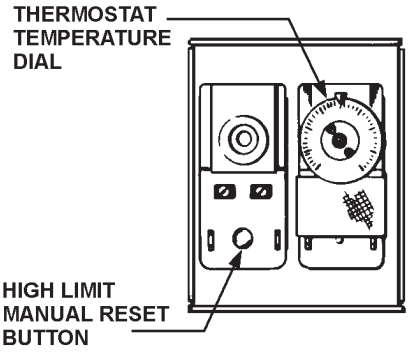


FIGURE 1.

Downloaded from www.Manualslib.com manuals search engine

Continued manual resetting of high limit control, preceded by higher than usual water temperature is evidence of high limit switch operation. The following are possible reasons for high limit switch operation.

- A malfunction in the thermostatic controls would allow the gas valve to remain open causing water temperature to exceed the thermostat setting. The water temperature would continue to rise until high limit switch operation.
- An improper thermostat setting for a short repetitive usage pattern may lead to a stacking effect. This causes a temperature gradient increasing from the bottom to the top of the tank. It is possible that the water at the high limit switch sensor could reach its maximum temperature before the water temperature at the thermostat reaches the dial setting, causing the high limit switch to activate.
- A warming of ambient conditions associated with seasonal change could magnify the stacking process described above to the point where high limit switch operation would occur.

Contact your dealer or servicer if continued high limit switch operation occurs.

DISHWASHING MACHINE REQUIREMENT

All dishwashing machines meeting the National Sanitation Foundation requirements are designed to operate with water flow pressures between 15 and 25 pounds per square inch. Flow pressures above 25 pounds per square inch, or below 15 pounds per square inch, will result in improperly sanitized dishes. Where pressures are high, a water pressure reducing or flow regulating control valve should be used in 180°F (82°C) line to the dishwashing machine, and should be adjusted to deliver water between these limits.

The National Sanitation Foundation also recommends circulation of 180°F (82°C) water. Where this is done, the circulation should be very gentle so that it does not cause any unnecessary turbulence inside the water heater. The circulation should be just enough to provide 180°F (82°C) water at the point of take-off to the dishwashing machine. Adjust flow by means of the plug cock in the circulating line.

INSTALLATION INSTRUCTIONS

REQUIRED ABILITY

INSTALLATION OR SERVICE OF THIS WATER HEATER REQUIRES ABILITY EQUIVALENT TO THAT OF A LICENSED TRADESMAN IN THE FIELD INVOLVED. PLUMBING, AIR SUPPLY, VENTING, GAS SUPPLY AND ELECTRICAL WORK ARE REQUIRED. **NOTE: AUTHORIZED START-UP IS REQUIRED.**

UNCRATING

The heater is shipped in standard form for vertical venting with a barometric draft control assembly in a separate carton.

Optional horizontal vent models are shipped with one (1) exhaust vent hood and one (1) flue reducer in a separate carton. Optional direct vent models are shipped with two (2) vent hoods in separate cartons. The exhaust vent hood carton contains one (1) exhaust vent hood and one (1) flue reducer. The intake vent hood carton contains one (1) intake vent hood and one (1) inlet adapter. All parts should be installed as received without alteration.

LOCATING THE HEATER

When installing the heater, consideration must be given to proper location. Location selected should be as close to the stack chimney as practicable, with adequate air supply and as centralized with the piping system as possible.

⚠ WARNING

THERE IS A RISK IN USING FUEL BURNING APPLIANCES SUCH AS GAS WATER HEATERS IN ROOMS, GARAGES OR OTHER AREAS WHERE GASOLINE, OTHER FLAMMABLE LIQUIDS OR ENGINE DRIVEN EQUIPMENT OR VEHICLES ARE STORED, OPERATED OR REPAIRED. FLAMMABLE VAPORS ARE HEAVY AND TRAVEL ALONG THE FLOOR AND MAY BE IGNITED BY THE HEATER'S IGNITER OR MAIN BURNER FLAMES CAUSING FIRE OR EXPLOSION. SOME LOCAL CODES PERMIT OPERATION OF GAS APPLIANCES IF INSTALLED 18 INCHES OR MORE ABOVE THE FLOOR. THIS MAY REDUCE THE RISK IF LOCATION IN SUCH AN AREA CANNOT BE AVOIDED.

THE HEATER SHALL BE LOCATED OR PROTECTED SO IT IS NOT SUBJECT TO PHYSICAL DAMAGE BY A MOVING VEHICLE.

⚠ WARNING

FLAMMABLE ITEMS, PRESSURIZED CONTAINERS OR ANY OTHER POTENTIAL FIRE HAZARDOUS ARTICLES MUST NEVER BE PLACED ON OR ADJACENT TO THE HEATER. OPEN CONTAINERS OF FLAMMABLE MATERIAL SHOULD NOT BE STORED OR USED IN THE SAME ROOM WITH THE HEATER.

THE HEATER MUST NOT BE LOCATED IN AN AREA WHERE IT WILL BE SUBJECT TO FREEZING.

LOCATE IT NEAR A FLOOR DRAIN. THE HEATER SHOULD BE LOCATED IN AN AREA WHERE LEAKAGE FROM THE HEATER OR CONNECTIONS WILL NOT RESULT IN DAMAGE TO THE ADJACENT AREA OR TO LOWER FLOORS OF THE STRUCTURE.

WHEN SUCH LOCATIONS CANNOT BE AVOIDED, A SUITABLE DRAIN PAN SHOULD BE INSTALLED UNDER THE HEATER. Such pans should be fabricated with sides at least 2" (50.8 mm) deep, with length and width at least 2" (50,8 mm) greater than the diameter of the heater and must be piped to an adequate drain. THE PAN MUST NOT RESTRICT COMBUSTION AIRFLOW.

Water heater life depends upon water quality, water pressure and the environment in which the water heater is installed. Water heaters are sometimes installed in locations where leakage may result in property damage, even with the use of a drain pan piped to a drain. However, unanticipated damage can be reduced or prevented by a leak detector or water shut-off device used in conjunction with a piped drain pan. These devices are available from some plumbing supply wholesalers and retailers, and detect and react to leakage in various ways:

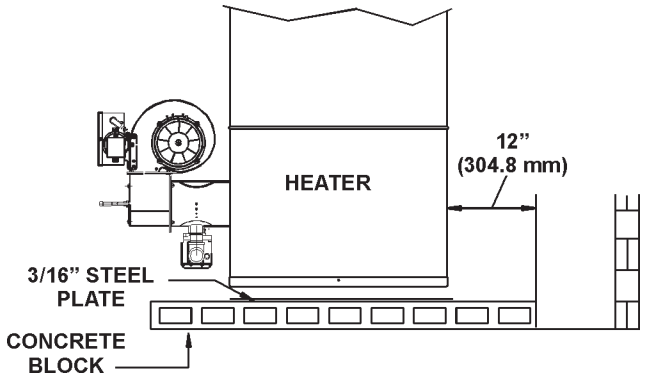
- Sensors mounted in the drain pan that trigger an alarm or turn off the incoming water to the water heater when leakage is detected.
- Sensors mounted in the drain pan that turn off the water supply to the entire home when water is detected in the drain pan.
- Water supply shut-off devices that activate based on the water pressure differential between the cold water and hot water pipes connected to the water heater.
- Devices that will turn off the gas supply to a gas water heater while at the same time shutting off its water supply.

Downloaded from www.Manualslib.com manuals search engine

Units, which are to be installed on combustible flooring, must be supported by a full layer of hollow concrete blocks, from 8" (203.2 mm) to 12" (304.8 mm) thick and extending 12" (304.8 mm) minimum beyond the heater in all directions. The concrete blocks must provide an unbroken concrete surface under the heater with the hollows running continuously and horizontally. A 3/16-inch steel plate must cover the concrete blocks, see Figure 2.

NOTE: If electrical conduits run under the floor of the proposed heater location, insulate the floor as recommended above.

For appliances installation locations with elevations above 2000 feet (609.6 m), refer to HIGH ALTITUDE INSTALLATIONS section.



PROPER INSTALLATION ON COMBUSTIBLE FLOORING
FIGURE 2.

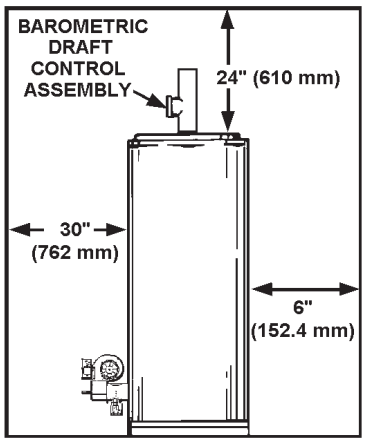
HARD WATER

Where hard water conditions exist, water softening or the threshold type of water treatment is recommended. This will protect the dishwasher, Coffee urns, water heaters, water piping and other equipment.

See MAINTENANCE section for details of tank cleanout procedure.

CLEARANCES

These heaters are designed for installation on non-combustible flooring in an alcove with clearances to combustible construction of 6" (152.4 mm) from the sides and rear, 24" (610 mm) from the top with a 6" (152.4 mm) minimum between vent pipe and ceiling. Minimum clearance from flue pipe to combustible material is 6" (152.4 mm), see Figure 3.



PROPER INSTALLATION CLEARANCES
FIGURE 3.

A clearance of 30" (762 mm) shall be maintained from serviceable parts, such as power burners, relief valves flue baffles, thermostats or drain valves.

AIR REQUIREMENTS

KEEP APPLIANCE AREA CLEAR AND FREE OF COMBUSTIBLE MATERIALS, GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS.

DO NOT OBSTRUCT THE FLOW OF COMBUSTION OR VENTILATING AIR.

⚠ WARNING

FOR SAFE OPERATION PROVIDE ADEQUATE AIR FOR COMBUSTION AND VENTILATION. AN INSUFFICIENT SUPPLY OF AIR WILL CAUSE RECIRCULATION OF COMBUSTION PRODUCTS RESULTING IN AIR CONTAMINATION THAT MAY BE HAZARDOUS TO LIFE. SUCH A CONDITION OFTEN WILL RESULT IN A YELLOW, LUMINOUS BURNER FLAME, CAUSING CARBONING OR SOOTING OF THE COMBUSTION CHAMBER, BURNERS AND FLUE TUBES AND CREATES A RISK OF ASPHYXIATION.

Where an exhaust fan is installed in the same room with a heater, sufficient openings for air must be provided in the walls. **UNDERSIZED OPENINGS WILL CAUSE AIR TO BE DRAWN INTO THE ROOM THROUGH THE CHIMNEY, CAUSING POOR COMBUSTION. SOOTING MAY RESULT IN SERIOUS DAMAGE TO THE HEATER AND RISK OF FIRE OR EXPLOSION.**

UNCONFINED SPACE

In buildings of conventional frame, brick or stone construction, unconfined spaces may provide adequate air for combustion and ventilation.

If the unconfined space is within a building of tight construction, (building using the following construction: weather stripping, heavy insulation, caulking, vapor barrier, etc.), air for combustion and ventilation must be obtained from outdoors or spaces freely communicating with the outdoors. The installation instructions for confined spaces in tightly constructed buildings must be followed to ensure adequate air supply.

CONFINED SPACE

When drawing combustion and dilution air from inside a conventionally constructed building to a confined space, such a space shall be provided with two permanent openings, ONE IN OR WITHIN 12 INCHES (304.8 mm) OF THE ENCLOSURE TOP AND ONE IN OR WITHIN 12 INCHES (304.8 mm) OF THE ENCLOSURE BOTTOM. Each opening shall have a free area of at least one square inch per 1000 Btuh of the total input of all appliances in the enclosure, but not less than 100 square inches.

If the confined space is within a building of tight construction, air for combustion and ventilation must be obtained from outdoors. When directly communication with the outdoors through vertical ducts, two permanent openings, located in the above manner, shall be provided. Each opening shall have a free area of not less than one square inch per 4000 Btuh of the total input of all appliances in the enclosure.

VENTING

THE INSTRUCTIONS IN THIS SECTION ON VENTING MUST BE FOLLOWED TO AVOID CHOKED COMBUSTION OR RECIRCULATION OF FLUE GASES. SUCH CONDITIONS CAUSE SOOTING OR RISKS OF FIRE AND ASPHYXIATION.

Downloaded from www.Manualslib.com manuals search engine

Heater must be protected from freezing downdrafts during shutdown periods.

The BTP 540A, 650A and 750A water heater are classified as a category I appliance (non-positive vent pressure, non-condensing) when installed with the supplied barometric draft control assembly in a vertical vent installation.

The BTPV 540A through 740A heater is classified as a category III appliance (positive vent pressure, non-condensing) when installed with supplied sidewall vent kits or direct vent kit.

All regulations pertaining to the venting of these heaters must be followed.

The following vent installation instructions cover vertical, horizontal, and direct vent applications.

VERTICAL VENTING - FOR BTP MODELS

BAROMETRIC DRAFT CONTROL ASSEMBLY

A double-acting barometric draft control assembly is provided with any unit intended for chimney venting. The purpose of this draft control is twofold. During downdrafts it acts as a pressure relief control to prevent the downdraft from blowing into the heater. It also allows for makeup air to enter the chimney without being drawn through the heater. In both cases the control prevents the heater performance from being adversely affected by conditions within the chimney.

The draft control assembly must be installed without alteration. This assembly is factory adjusted for horizontal application only and must be attached to the heater as shown in Figure 4. The direction in which the outlet to the draft controls assembly faces is arbitrary. The assembly must be fitted to the jacket cover such that it is plumb and level to the ground. Fasten the draft control assembly to the top cover using sheet metal screws at three locations, or more, as required.

Damper or other obstructions must not be installed between the heater and the barometric draft control assembly.

Do not adjust settings on gate.

When installed, the damper gate must pivot freely in the ring guides. This gate will automatically adjust to regulate the chimney draft imposed on the heater.

VENT CONNECTIONS

Vent connections must be made to an adequate stack or chimney. Refer to the National Fuel Gas Code or to the vent pipe manufacturer's gas vent and chimney sizing table to properly design and size the venting system. Refer to Table 1 for the vent pipe size required for installation to the barometric draft control assembly outlet.

TABLE 1.

Model	Flue Outlet
BTP-540A	9" (228.6 mm)
BTP-650A	9" (228.6 mm)
BTP-740A	9" (228.6 mm)

Single-wall or type B venting may be used with these heaters in vertical vent installations. All local and utility regulations on venting must be followed.

NOTE: A NEGATIVE DRAFT MUST BE MAINTAINED IN VENTING.

A negative draft of 0.02" to 0.04" w.c. Must be maintained in venting system. Measure draft at the location illustrated in Figure 4. Adjust the control counter-weights if necessary as shown in the MAINTENANCE portion of this manual.

Where an existing chimney or vent is to be used, be sure that the chimney or vent has adequate capacity for the number and sizes of gas appliances being vented through it. Inspect the chimney or vent and remove all soot or other obstructions, which will retard free draft.

Vent connectors making horizontal runs must have a minimum upward slope toward the chimney or vent of ¼ inch per foot. Vent connector length should be kept as short as possible. Be sure that the vent pipe does not extend beyond the inside wall of a chimney, see Figure 4.

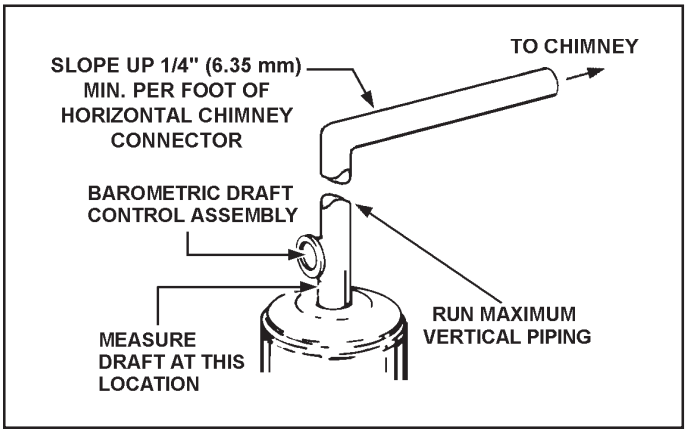

TO CHIMNEY
SLOPE UP 1/4" (6.35 mm) MIN. PER FOOT OF HORIZONTAL CHIMNEY CONNECTOR
BAROMETRIC DRAFT CONTROL ASSEMBLY
RUN MAXIMUM VERTICAL PIPING
MEASURE DRAFT AT THIS LOCATION

FIGURE 4.

In venting systems where a continuous or intermittent back (positive) draft is found to exist, the cause must be determined and corrected. In some cases, a special vent cap may be required.

⚠ WARNING

Failure to correct back drafts may cause air contamination and unsafe conditions.

Do not connect the heater to a common vent or chimney with solid fuel burning equipment. This practice is prohibited by many local building codes as is the practice of venting gas fired equipment to the ductwork of ventilation systems.

Connectors shall not be connected to a chimney, vent or venting system served by a power exhauster, unless the connection is made on the negative pressure side of the exhauster.

Do not connect any heater vented by natural draft to any vent serving mechanical draft equipment operating under positive vent pressure such as category III or category IV appliances.

HORIZONTAL (SIDE-WALL) VENTING - FOR BTPV MODELS

An exhaust vent hood, vent hood and a flue reducer are supplied with any unit intended for through-the-wall horizontal venting. These parts must be installed without alteration. The vent hood adapter is designed for use with Selkirk Metalbestos Model PS or Model G venting, see Figure 7 on page 10.

Downloaded from www.Manualslib.com manuals search engine

Refer to Table 2 for limitations of venting system design for horizontal venting.

TABLE 2

		BTPV-540A-740A
Flue Outlet Dia. (Inches/mm)		9" (228.6)
Flue Reducer Dimensions -Supplied (Inches/mm)		9" x 8" 228.6 x 203.2
Minimum Outlet Vent Dia. (Inches/mm)		8" (203.2)
Maximum Number Of Elbows	90°	4
	45°	8
Maximum Total Vent System Length, Equiv. Feet/Meters		75 (23 m)

When calculating the equivalent length of a venting system each 90° elbow is equivalent to 10 feet (3 m) of straight pipe. In no case 45° elbow is equivalent to 5 feet (1.5 m) of straight pipe. In no case may the sum of the straight pipe lengths and the equivalent length of the elbows exceeds 80 feet (24.3 m).

Note the minimum vent diameter in Table 2.

Refer to Table 3 for the correct vent terminal size for each heater. The dimensions noted in Table 3 refer to Figure 5.

TABLE 3

Heater Model	Terminal Model	A	B	C	D	Rough-In Dimensions
BTPV 540A-740A	VH-1-8"	19-7/8"	13"	10-9/16"	8-5/8"	11-1/16"

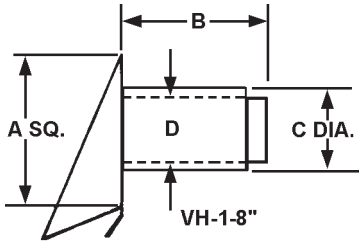


FIGURE 5

Use only the sidewall vent terminal supplied with the heater. These terminals are specifically listed for use on these A.O. Smith heaters.

VENT TERMINAL LOCATIONS-EXHAUST

When considering location for sidewall vent terminals refer to the latest edition of the National Fuel Gas Code which recommends that vent terminals:

1. Shall be located not less than 12" (304.8 mm) above grade.
2. Shall be located not less than 7 feet (2.1 m) above grade when adjacent to a public walkway.
3. Shall terminate at least 3 feet (0.9 m) above any forced air inlet within 10 feet (3 m).
4. Shall terminate at least 4 feet (1.2 m) below, 4 feet (1.2 m) horizontally from or 1 foot above any door, window or gravity air inlet into any building.
5. Shall not be closer than 3 feet (0.9 m) from the inside corner of an L- shaped structure.
6. Shall be located above the snow line in geographical areas where snow accumulates.

VENT SYSTEM INSTALLATION

This heater is a category III appliance when horizontally vented through a wall using the supplied sidewall vent terminal. All national and local codes pertaining to the installation of such venting systems must be followed.

Horizontal portions of the vent system must be installed with a minimum upward slope of 1/4" per foot of length.

All joints and seams in the venting system must be sealed gas tight. If a silicone sealer is used, it must have a continuous temperature rating of at least 500°F (260°C); Dow Corning 736 or equivalent must be used.

⚠ CAUTION

Use only the vent hood supplied with this kit. Only supplied hood provides required clearances from combustibles, both through the wall and the exterior siding. Termination of a sidewall vent system with a device other than the supplied vent hood could affect system performance and result in a safety hazard.

IMPORTANT

Plan the layout of the vent system backward from the vent termination to the water heater.

1. Use the layout of the vent system backward from the vent termination to the water heater.

   BEWARE OF CONCEALED WIRING AND PIPING INSIDE OF WALL. REFER TO TABLE 5 FOR THE MAXIMUM WALL THICKNESS "B" FOR EACH MODEL.

2. Slide hood through opening from outside. Fasten hood to exterior wall with anchors and screws supplied.
3. Install covers plate and fasten to inside wall with 4 screws.
4. Attach a seal ring (Meltalbestos SR or equivalent) to the vent hood collar, see Figure 7. Attach Selkirk Metalbestos model PS or model G venting to the seal ring following the venting manufacturer's instructions. For total safety, it is recommended that only venting listed for use with category III appliances (positive vent pressure, non-condensing) should be used between the heater and the vent hood, even through national or local codes may allow the use of type B or single-wall vent.
5. Install the remaining vent sections back to the heater, following the venting manufacturer's instructions on assembling and sealing joints. Follow good venting practice regarding properly supporting vent system and keeping the number of offsets to a minimum. See Table 2 for the maximum allowable number of elbows in venting system.
6. Install the flue reducer included with the exhaust hood between the vent system and the heater.
7. Seal all vent connections and venting with sealants supplied by vent pipe manufacturer or with a high-temperature silicone sealant suitable for continuous temperatures of 500°F (260°C). Acceptable sealant include Dow Corning 736 or equivalent.

Downloaded from www.Manualslib.com manuals search engine

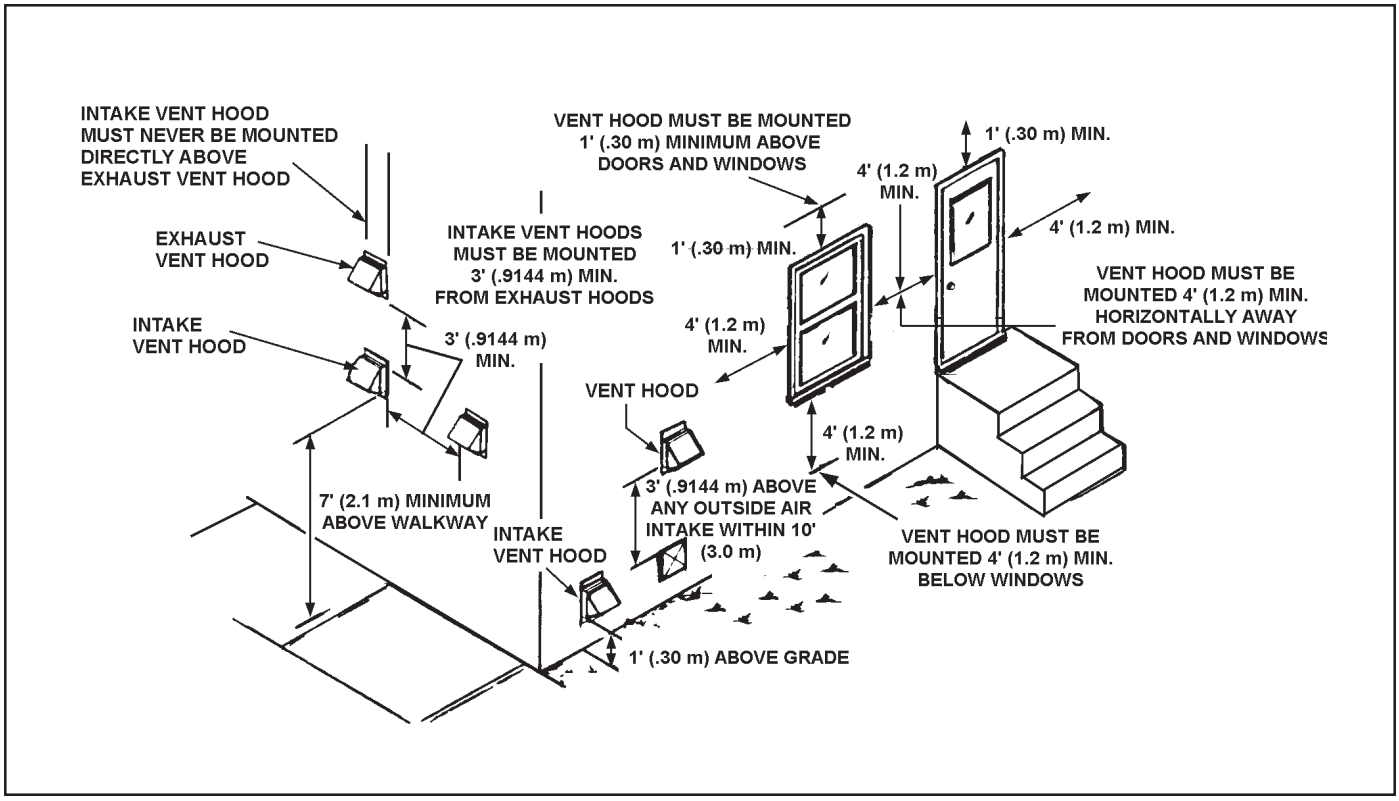


FIGURE 6.

DIRECT VENTING - FOR BTPV MODELS

All exhaust vent terminal, flue reducer, and intake vent terminal are supplied with any unit intended for direct venting. These parts must be installed without alteration.

This heater is category III appliance when used in a direct vent application. All national and local codes pertaining to the installation of such an appliance must be followed.

Horizontal portions of the exhaust vent system must be installed with a minimum upward slope of 1/4" (6.35 mm) per foot of length.

Selkirk metalbestos model PS or G vent is approved for use as exhaust venting on these models. Model PS is a double-wall vent with a 1" (25.4 mm) air space between pipes. Model G is a single-wall variation of model PS for use where combustible clearance is not a concern, see Table 4.

TABLE 4.

Selkirk Metalbestos Model PS Clearance to Combustibles	
Interior	6" (152.4 mm)
Exterior	6" (152.4 mm)

8" diameter PVC or galvanized pipe is approved for use as intake venting on these models. Class 63, 100, 125, 200, and schedule 40 pipe may be used for PVC pipe. Intake venting must be adequately supported to avoid unnecessary stress on vent hood, venting, or burner.

See Table 5 limitations on venting system design for direct vent installations.

TABLE 5.

Dimension in Inches (mm)		BTPV 540A -740A
Flue Outlet Dia.		9 (229)
Flue Reducer Dimension (Supplied)		9 x 8 (229 x 203)
Min. Exhaust Vent Dia. Inch (mm)		8 (203)
Min. Intake Vent Dia. Inch (mm)		8 (203)
Maximum Number Of Elbows, Intake	90°	4
	45°	8
Maximum Number Of Elbows, Exhaust	90°	4
	45°	8
Total Intake Vent Length, Equiv. Ft.	Max.	75 (23 m)
	Min.	3 (1 m)
Total Exhaust Vent Length, Equiv. Ft.	Max.	75 (23 m)
	Min.	6 (1.8)

Note: Barometric draft control is not used in direct vent installations as the venting system must be sealed.

When calculating the equivalent length of a venting system each 90 elbow is equivalent to 10 feet of straight pipe. Each 45 elbow is equivalent to 5 feet (1.5 m) of straight pipe. Do not exceed the maximum number of elbows as shown in Table 5. In no case may the sum of the straight pipe lengths and the equivalent lengths of the elbows exceed the valves in Table 5.

VENT TERMINAL LOCATIONS-EXHAUST

See "Horizontal Venting" in this manual for acceptable locations for exhaust hoods.

VENT TERMINAL LOCATIONS-INTAKE

When considering locations for the intake terminal, bear in mind that the terminal:

Downloaded from www.Manualslib.com manuals search engine

1. Shall be located not less than 12” (304.8 mm) above grade.

2. Shall be located not less than 3 (.9144 m) feet horizontally from and not less than 3 feet (.9144 m) below an exhaust vent terminal.

3. Shall not be located directly above an exhaust terminal.

4. Shall be located 12” (304.8 mm) above the snow line in geographical areas where snow accumulates.

5. Shall be located not less than 7 feet 2.1 m) above grade when adjacent to a public walkway.

6. Shall not be closer than 3 feet (.9144 m) from the inside corner of an L - shaped structure.

7. Shall be located not less than 3 feet (.9144 m) horizontally or 3 feet (.9144 m) vertically from gas line, meter, or other gas supply entering a structure, see Figure 6.

DIRECT VENT SYSTEM INSTALLATION

Plan the vent system backwards from the vent hood to the heater.

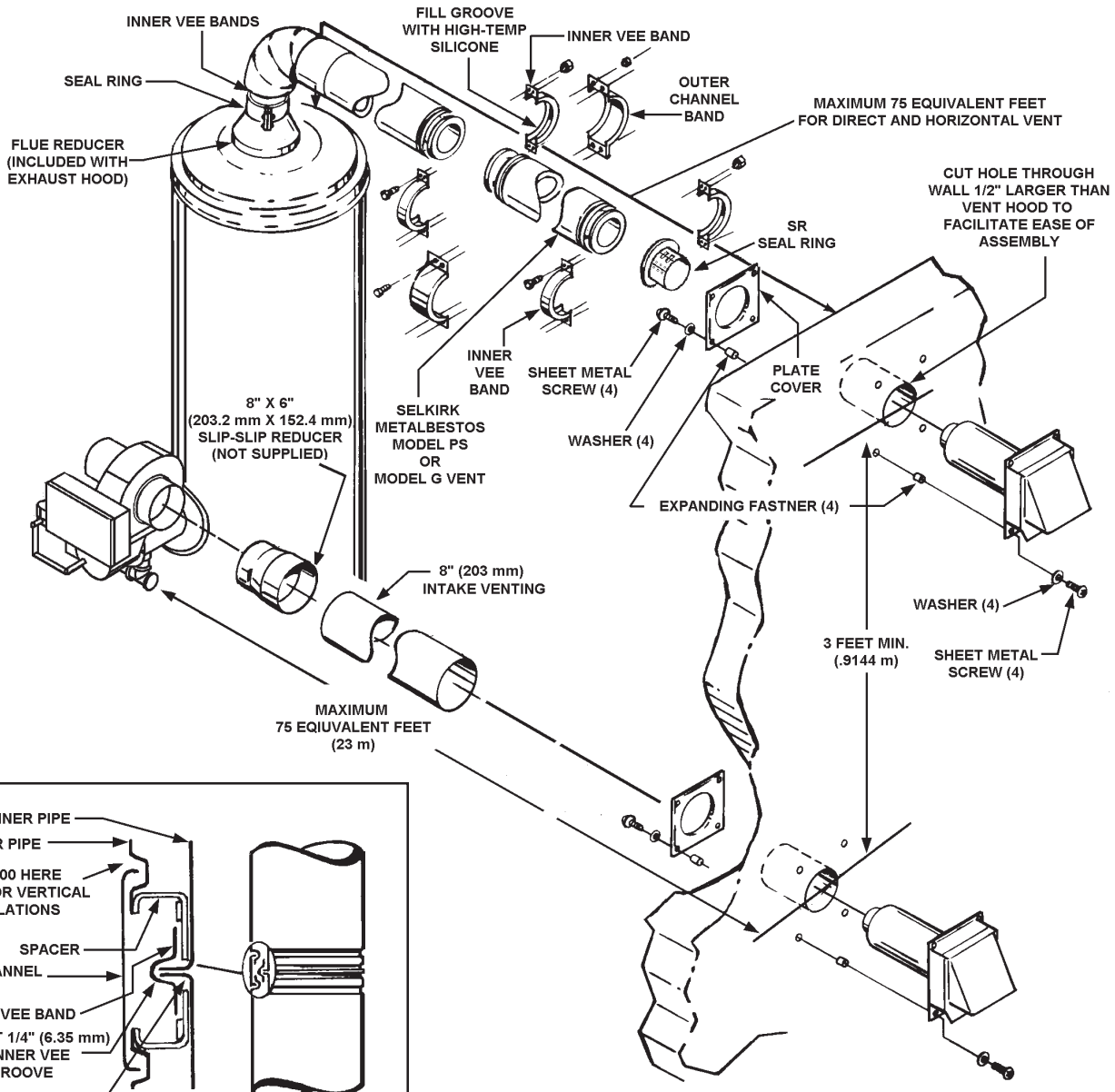
1. Use the inside wall cover plate as a template to mark two holes in the appropriate places on the wall. Cut holes 1/2” (12.7 mm) larger to facilitate easy installation of vent hoods, see Figures 6 and 7.

   BEWARE OF CONCEALED WIRING AND PIPING INSIDE WALL. REFER TO TABLE 3 FOR THE MAXIMUM WALL THICKNESS “B” FOR EACH MODEL.

2. Slide hoods through openings from outside. Fasten hoods to exterior wall with anchors and screws supplied.

3. Install cover plate and fasten to inside wall with 4 screws

4. Attach a seal ring (Selkirk Metalbestos Model SR or equivalent) to the vent hood collar, see Figure 7.


INNER VEE BANDS
FILL GROOVE WITH HIGH-TEMP SILICONE
INNER VEE BAND
SEAL RING
OUTER CHANNEL BAND
MAXIMUM 75 EQUIVALENT FEET FOR DIRECT AND HORIZONTAL VENT
FLUE REDUCER (INCLUDED WITH EXHAUST HOOD)
CUT HOLE THROUGH WALL 1/2" LARGER THAN VENT HOOD TO FACILITATE EASE OF ASSEMBLY
SR SEAL RING
INNER VEE BAND
SHEET METAL SCREW (4)
PLATE COVER
8" X 6" (203.2 mm X 152.4 mm) SLIP-SLIP REDUCER (NOT SUPPLIED)
SELKIRK METALBESTOS MODEL PS OR MODEL G VENT
WASHER (4)
EXPANDING FASTNER (4)
8" (203 mm) INTAKE VENTING
WASHER (4)
3 FEET MIN. (.9144 m)
SHEET METAL SCREW (4)
MAXIMUM 75 EQIUVALENT FEET (23 m)

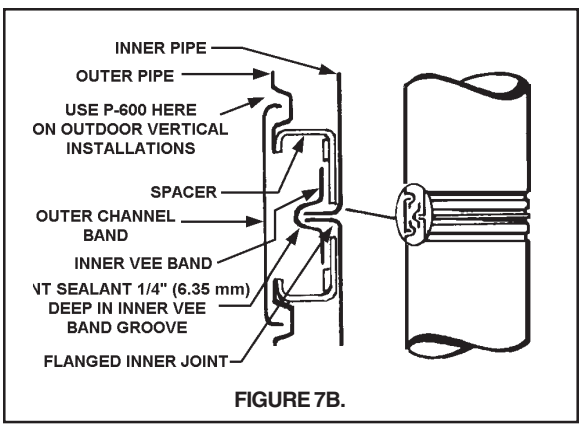

INNER PIPE
OUTER PIPE
USE P-600 HERE ON OUTDOOR VERTICAL INSTALLATIONS
SPACER
OUTER CHANNEL BAND
INNER VEE BAND
NT SEALANT 1/4" (6.35 mm) DEEP IN INNER VEE BAND GROOVE
FLANGED INNER JOINT

FIGURE 7B.

FIGURE 7.

Downloaded from www.Manualslib.com manuals search engine

5. Attach a properly sized length of Selkirk Metalbestos model PS or model G venting to the exhaust vent adapter using the inner vee bands, see Figures 7 and 7B on page 10.

6. Fill the grooves in both inner vee bands with high-temp silicone sealant, Dow Corning 736 or equivalent.

7. Position the inner vee bands around the inner pipe flanges and tighten the screws securing the bands.

8. Align the outer channel band with the outer pipe grooves and tighten the screws securing the bands.

9. Repeat steps 6-8 for each successive pipe length until the venting reaches the heater.

10. Follow the manufacturer's instructions for proper support and guide spacing for horizontal runs of pipe, see Table 6.

TABLE 6.

Vent Diameter	S	F
8" - BTPV -540A, 650A & 740A	15' 3"	7' 6"

S = Maximum spacing between two guides or a support and a guide in either a vertical or horizontal direction.

F = Maximum height above a guide or support for free standing system above a roof or parapet wall.

11. Use an expansion joint between any two fixed points in the exhaust venting system wherever the expansion may exceed 1/4". Selkirk Metalbestos model PS and model G venting will expand by one inch per 100°F in gas temperature per 100 feet of vent length. The expansion can be calculated by the following formula:

$$\text{Expansion, Inches} = \text{Vent length between two fixed points, feet} \times \frac{5}{100}$$

If the expansion calculated is greater than 1/4", an expansion joint must be used between the two fixed points.

12. Attach the flue reducer included in the exhaust vent hood package to the flue collar on the heater.

13. Attach the flue reducer to the vent system using a seal ring. Attach this ring to the venting using the inner vee bands as outlined in Steps 5-7.

14. Attach 8" air-intake connector to intake vent hood collar. It may be necessary to use a slip-slip coupling to fit the pipe to the intake vent hood.

15. Attach 8" air-intake connector back to the 6" burner air inlet with 8" x 6" reducer. Prime and cement each joint to assure gas-tight construction.

16. Seal all joints at the vent hoods with silicone sealant. Also seal the joints at the flue collar and air inlet adapter. Joint on the exhaust side must be sealed with high-temp silicone sealant, Dow Corning 736 or equivalent.

⚠ WARNING

PRIMERS AND CEMENTS ARE EXTREMELY FLAMMABLE, AND MUST NOT BE STORED OR USED NEAR HEAT OR OPEN FLAME. ALLOW ADEQUATE CURING TIME BEFORE OPERATING HEATER.

DRAIN VALVE AND ACCESS PANELS

The heaters are equipped with a 3/4" NPT drain valves mounted above and to the left of the burner.

An access panel is located above and to the right of the burner, see Figure 8. This panel covers the cleanout opening in the tank which is sealed by a gasket and cover. Another cleanout access panel is located towards the back of the heater.

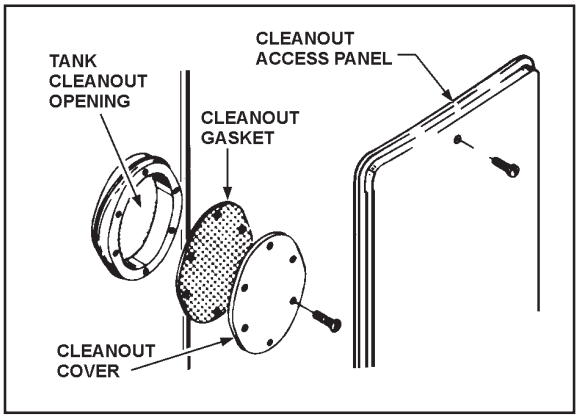


FIGURE 8.

GAS PIPING

Contact your local gas service company to ensure that adequate gas service is available and to review applicable installation codes for your area.

Size the main gas line in accordance with Table 9 and 9A. Minimum required gas supply pipe size is 1 1/4". The figures shown are for straight lengths of pipe at 0.5 in. w.c. pressure drop, which is considered normal for low pressure systems. Note that fittings such as elbows and tees will add to the pipe pressure drop.

TABLE 9
MAXIMUM CAPACITY OF PIPE IN CUBIC FEET OF GAS PER HOUR (Based upon a Pressure Drop of 0.5 inch Water Column and 0.5 Specific Gravity Gas and max. gas press. of .5 psig)

LENGTH IN FEET	Nominal Iron Pipe Sizes, Inches								
	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"
10	175	360	680	1400	2100	3960	6300	11000	23000
20	120	250	485	950	1460	2750	4360	7700	15800
30	97	200	375	770	1180	2200	3520	6250	12800
40	82	170	320	660	990	1900	3000	5300	10900
50	73	151	285	580	900	1680	2650	4750	9700
60	66	138	260	530	810	1520	2400	4300	8800
70	61	125	240	490	750	1400	2250	3900	8100
80	57	118	220	460	690	1300	2050	3700	7500
90	53	110	205	430	650	1220	1950	3450	7200
100	50	103	195	400	620	1150	1850	3250	6700
125	44	93	175	360	550	1020	1650	2950	6000
150	40	84	160	325	500	950	1500	2650	5500
175	37	77	145	300	460	850	1370	2450	5000
200	35	72	135	280	430	800	1280	2280	4600

Downloaded from www.Manualslib.com manuals search engine

TABLE 9A
MAXIMUM CAPACITY OF PIPE IN CUBIC FEET OF GAS PER HOUR (Based upon a Pressure Drop of 0.5 inch Water Column and 0.5 Specific Gravity Gas and max. gas press. of .5 psig)

LENGTH IN METERS	Nominal Iron Pipe Sizes, Millimeters								
	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"
3.0	51	105	199	410	615	1160	1845	3221	6735
6.1	35	73	142	278	428	805	1277	2255	4626
9.1	28	59	110	225	346	644	1031	1830	3748
12.2	24	50	94	193	290	556	878	1552	3192
15.2	21	44	83	170	264	492	776	1391	2840
18.3	19	40	76	155	237	445	703	1259	2577
21.3	18	37	70	143	220	410	659	1142	2372
24.4	17	35	64	135	202	381	600	1083	2196
27.4	16	32	60	126	190	357	571	1010	2108
30.5	15	30	57	117	182	337	542	952	1962
38.1	13	27	51	105	161	299	483	864	1757
45.7	12	25	47	95	146	278	439	776	1610
53.3	11	23	42	88	135	249	401	717	1464
61.0	10	21	40	82	126	234	375	688	1347

⚠ WARNING

THE HEATER IS NOT INTENDED FOR OPERATION AT HIGHER THAN 14" (3.5 kPa) WATER COLUMN (1/2 POUND PER SQUARE INCH) SUPPLY GAS PRESSURE. HIGHER GAS PRESSURES REQUIRE SUPPLEMENTAL REDUCING SERVICE REGULATION. EXPOSURE TO HIGHER GAS SUPPLY PRESSURE MAY CAUSE DAMAGE TO THE GAS CONTROLS WHICH COULD RESULT IN FIRE OR EXPLOSION. IF OVERPRESSURE HAS OCCURRED SUCH AS THROUGH IMPROPER TESTING OF GAS LINES OR EMERGENCY MALFUNCTION OF THE SUPPLY SYSTEM, THE GAS VALVE MUST BE CHECKED FOR SAFE OPERATION. MAKE SURE THAT THE OUTSIDE VENTS ON THE SUPPLY REGULATORS AND THE SAFETY VENT VALVES ARE PROTECTED AGAINST BLOCKAGE. THESE ARE PARTS OF THE GAS SUPPLY SYSTEM, NOT THE HEATER. VENT BLOCKAGE MAY OCCUR DURING ICE STORMS.

IT IS IMPORTANT TO GUARD AGAINST GAS VALVE FOULING FROM CONTAMINANTS IN THE GAS WAYS. SUCH FOULING MAY CAUSE IMPROPER OPERATION, FIRE OR EXPLOSION. IF COPPER SUPPLY LINES ARE USED THEY MUST BE INTERNALLY TINNED AND CERTIFIED FOR GAS SERVICE.

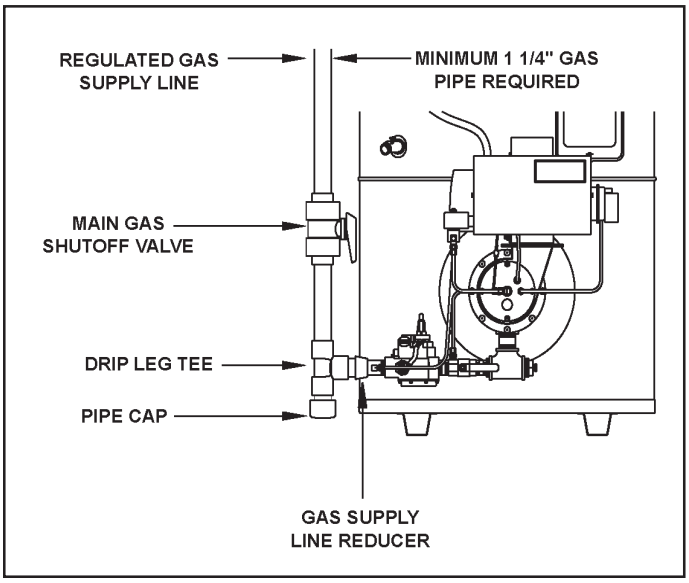
BEFORE ATTACHING THE GAS LINE, BE SURE THAT ALL GAS PIPE IS CLEAN ON THE INSIDE.

TO TRAP ANY DIRT OR FOREIGN MATERIAL IN THE GAS SUPPLY LINE, A DIRT LEG (SOMETIMES CALLED A SEDIMENT TRAP OR DRIP LEG) MUST BE INCORPORATED IN THE PIPING (SEE FIG. 10) THE DIRT LEG MUST BE READILY ACCESSIBLE AND NOT SUBJECT TO FREEZING CONDITIONS. INSTALL IN ACCORDANCE WITH RECOMMENDATIONS OF SERVING GAS SUPPLIERS. REFER TO THE NATIONAL FUEL GAS CODE.

To prevent damage, care must be taken not to apply too much torque when attaching gas supply to gas valve inlet.

Apply joint compounds (pipe dope) sparingly and only to the male threads of pipe joints. Do not apply compound to the first two threads. Use compounds resistant to the action of liquefied petroleum gases.

DISCONNECT THE APPLIANCE AND ITS MANUAL GAS SHUT-OFF VALVE FROM THE GAS SUPPLY PIPING SYSTEM DURING ANY SUPPLY PRESSURE TESTING EXCEEDING 1/2 PSIG. GAS SUPPLY LINE MUST BE CAPPED WHEN DISCONNECTED FROM THE HEATER. FOR TEST PRESSURES OF ½ PSIG OR LESS, THE APPLIANCE NEED NOT BE DISCONNECTED, BUT MUST BE ISOLATED FROM THE SUPPLY PRESSURE TEST BY CLOSING THE MANUAL GAS SHUT-OFF VALVE.



GAS PIPING AND DIRT LEG INSTALLATION
FIGURE 9.

BEFORE PLACING THE HEATER IN OPERATION, CHECK FOR GAS LEAKAGE. USE SOAP AND WATER SOLUTION OR OTHER MATERIAL ACCEPTABLE FOR THE PURPOSE IN LOCATING GAS LEAKS. **DO NOT USE MATCHES, CANDLES, FLAME OR OTHER SOURCES OF IGNITION FOR THIS PURPOSE.**

GAS METER SIZE – CITY GASES ONLY

Be sure that the gas meter has sufficient capacity to supply the full rated gas input of the water heater as well as the requirements of all other gas fired equipment supplied by the meter. If the gas meter is too small, request the gas company to install a larger meter having adequate capacity.

GAS PRESSURE REGULATION

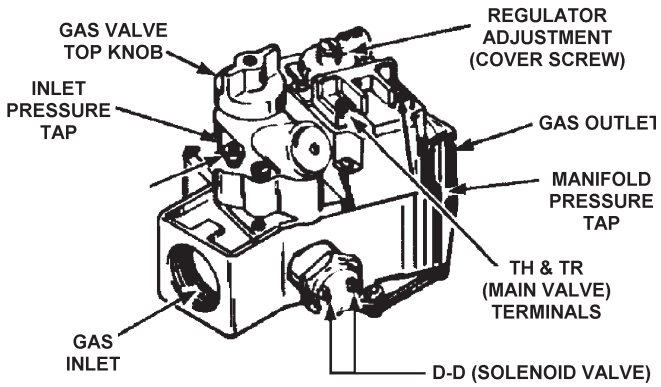
Main line gas pressure to the water heater should be between 8" w.c. (2 kPa) minimum (dynamic pressure or net pressure) and 14" (3.5 kPa) maximum w.c. (static pressure). The inlet gas pressure must not exceed the maximum value. A service regulator is necessary if higher gas pressures are encountered, see Table 10.

Due to pressure drop along gas supply line, to maintain 8" w.c. (2 kPa) minimum dynamic pressure, initial gas inlet pressure must be set at higher than 8" w.c. (2 kPa). The gas regulator must be properly sized to prevent unstable control or excessive pressure drop.

GAS VALVES

Figure 10 shows the gas control valve that is supplied on these heaters.

Downloaded from www.Manualslib.com manuals search engine



ROBERTSHAW® 7000 DERHC GAS CONTROL VALVE
FIGURE 10.

WATER LINE CONNECTIONS

Following are detailed installation diagrams for typical methods of application for the water heaters.

The water heater may be installed by itself, or with a separate storage tank, on both single and two-temperature systems. When used with a separate storage tank, the circulation may be either by gravity or by means of a circulating pump. When a circulating pump is used it is important to note that the flow rate should be slow so that there will be a minimum of turbulence inside the heater.

If a water heater is installed in a closed water system, contact the water supplier or local plumbing inspector on how to control this situation.

⚠ CAUTION

A closed system will exist if a check valve (without bypass) pressure reducing valve (without bypass), or a water meter (without bypass) is installed in the cold water line between the water heater and street main (or well).

Excessive pressure may develop causing premature tank failure or intermittent relief valve operation. This is not a warranty failure. An expansion tank or a similar device may be required in the inlet supply line between the appliance and the meter or valve to compensate for the thermal expansion of water under supply pressure.

SYSTEM CONNECTIONS

The system installation must conform to these instructions and to the local code authority having jurisdiction. Good practice requires that all heavy piping be supported.

THERMOMETERS (Not supplied)

Thermometers should be obtained and field installed as shown in the installation diagrams.

Thermometers are installed in the system as a means of detecting the temperature of the outlet water supply.

RELIEF VALVE

This heater is equipped with an approved temperature and pressure relief valve. ASME ratings cover pressure relief. A.G.A ratings cover release rate with temperature actuation.

FOR SAFE OPERATION OF THE WATER HEATER, THE RELIEF VALVE(S) MUST NOT BE REMOVED OR PLUGGED.

In addition to the appliance relief valve, each remote storage tank that may be used in conjunction with this appliance shall also be installed with a properly sized, rated and approved temperature (ANSI) and pressure (ASME) relief valve(s). This relief valve shall comply with the standard for relief valves and automatic gas shut-off devices for hot water supply systems, ANSI Z21.22/CSA 4.4.

Your local code authority may have other specific relief valve requirements.

⚠ WARNING

THE PURPOSE OF A RELIEF VALVE IS TO AVOID EXCESSIVE PRESSURE OR TEMPERATURE INTO THE STEAM RANGE, WHICH MAY CAUSE SCALDING AT FIXTURES, TANK EXPLOSION, AND SYSTEM OR HEATER DAMAGE. NO VALVE IS TO BE PLACED BETWEEN THE RELIEF VALVE AND THE TANK.

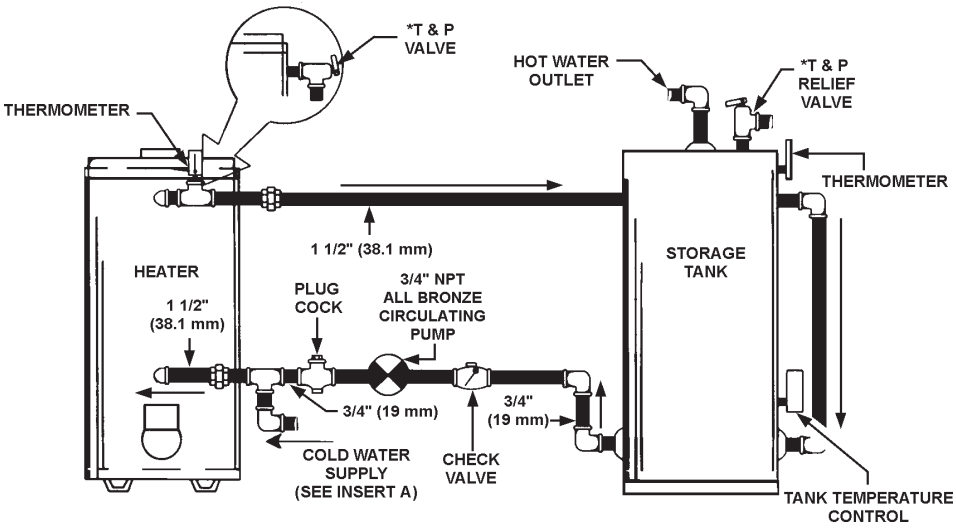
A DRAIN LINE MUST BE CONNECTED TO THE RELIEF VALVE TO DIRECT DISCHARGE TO A SAFE LOCATION TO AVOID SCALDING OR WATER DAMAGE. THIS LINE MUST NOT BE REDUCED FROM THE SIZE OF THE VALVE OUTLET AND MUST NOT CONTAIN VALVES, RESTRICTIONS NOR SHOULD IT BE LOCATED IN FREEZING AREAS. DO NOT THREAD OR CAP THE END OF THIS LINE. RESTRICTED OR BLOCKED DISCHARGE WILL DEFECT THE PURPOSE OF THE VALVE AND IS UNSAFE. DISCHARGE LINE SHALL BE INSTALLED TO ALLOW COMPLETE DRAINAGE OF BOTH THE VALVE AND LINE.

® Robertshaw is a registered trademark of the Robertshaw Controls Company Corporation

Downloaded from www.Manualslib.com manuals search engine

INSTALLATION DIAGRAMS

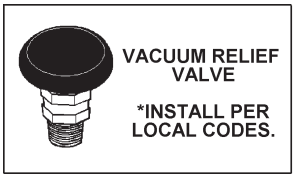
ONE TEMPERATURE - ONE HEATER VERTICAL STORAGE TANK FORCED CIRCULATION WITH OR WITHOUT BUILDING RECIRCULATION



DANGER

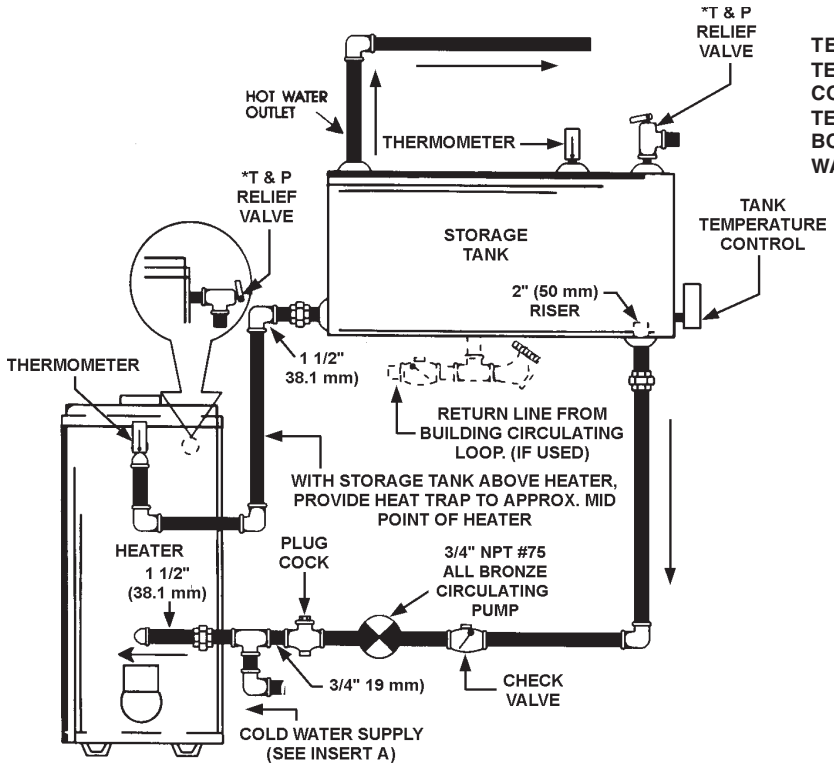
IF BUILDING COLD WATER SUPPLY HAS A BACKFLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

NOTE: CONNECT RETURN LINE FROM HOT WATER RECIRCULATING LOOP (IF USED) TO COLD WATER INLET LINE.



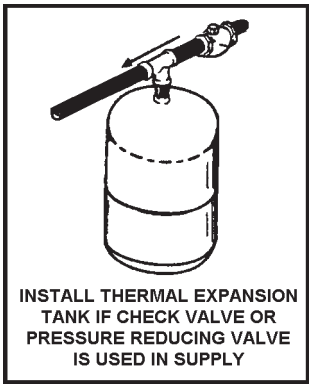
NOTE:
WHEN USING AN A.O. SMITH T-140, 200, 350 OR 400
STORAGE TANK, USE LOWER 3/4" OPENING FOR TANK TEMP. CONTROL

ONE TEMPERATURE - ONE HEATER HORIZONTAL STORAGE TANK FORCED CIRCULATION WITH OR WITHOUT BUILDING RECIRCULATION

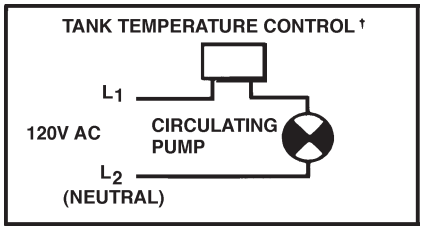

*T & P RELIEF VALVE
HOT WATER OUTLET
THERMOMETER
*T & P RELIEF VALVE
TANK TEMPERATURE CONTROL
STORAGE TANK
2" (50 mm) RISER
THERMOMETER
1 1/2" 38.1 mm)
RETURN LINE FROM BUILDING CIRCULATING LOOP. (IF USED)
WITH STORAGE TANK ABOVE HEATER, PROVIDE HEAT TRAP TO APPROX. MID POINT OF HEATER
HEATER 1 1/2" (38.1 mm)
PLUG COCK
3/4" NPT #75 ALL BRONZE CIRCULATING PUMP
3/4" 19 mm)
CHECK VALVE
COLD WATER SUPPLY (SEE INSERT A)

DANGER

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGE 23. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES.



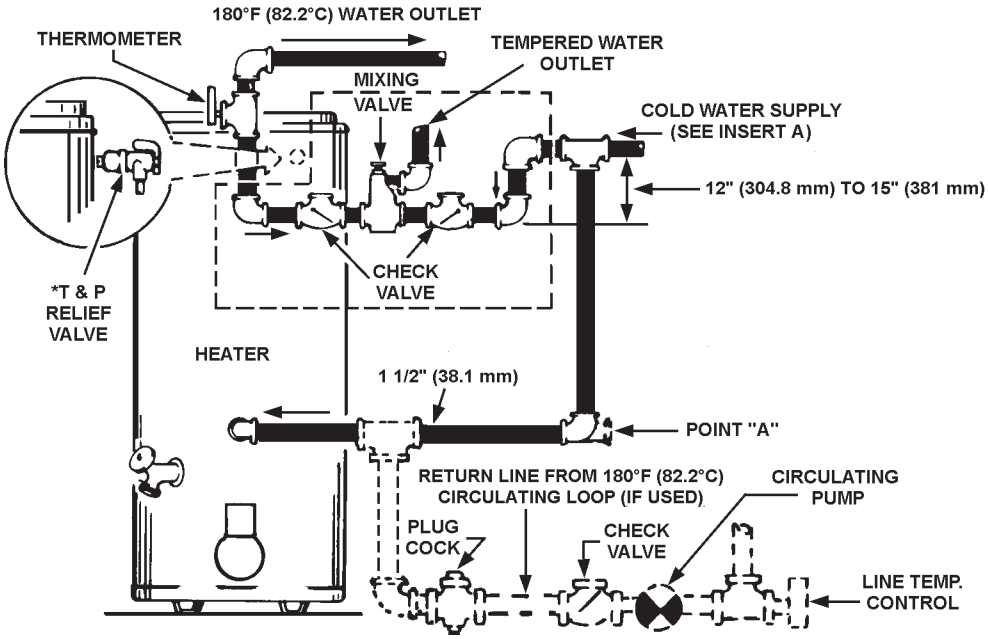
CIRCULATING PUMP WIRING DIAGRAM



*PIPE TO OPEN DRAIN INSTALL IN ACCORDANCE WITH LOCAL CODES

Downloaded from www.Manualslib.com manuals search engine

TWO TEMPERATURE - ONE HEATER HIGH TEMPERATURE WITH OR WITHOUT BUILDING RECIRCULATION



*PIPE RELIEF VALVE TO OPEN DRAIN

NOTE: IF TEMPERED WATER IS RECIRCULATED, RETURN LINE SHOULD BE CONNECTED AT POINT "A".

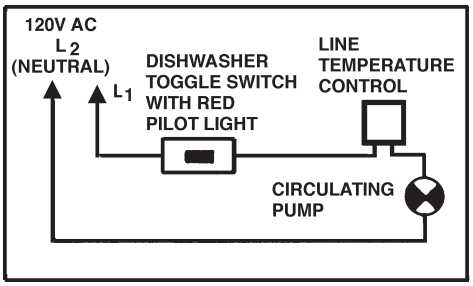
INSTALL IN ACCORDANCE WITH LOCAL CODES

⚠ DANGER

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGE 23. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES.

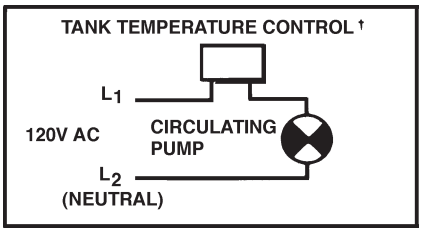
CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACKFLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

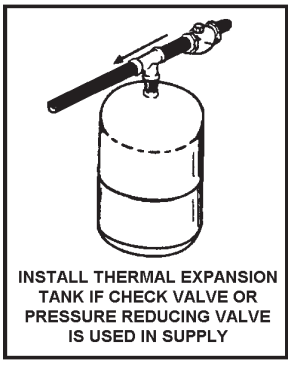
WIRING DIAGRAM FOR 180°F LOOP (IF USED)



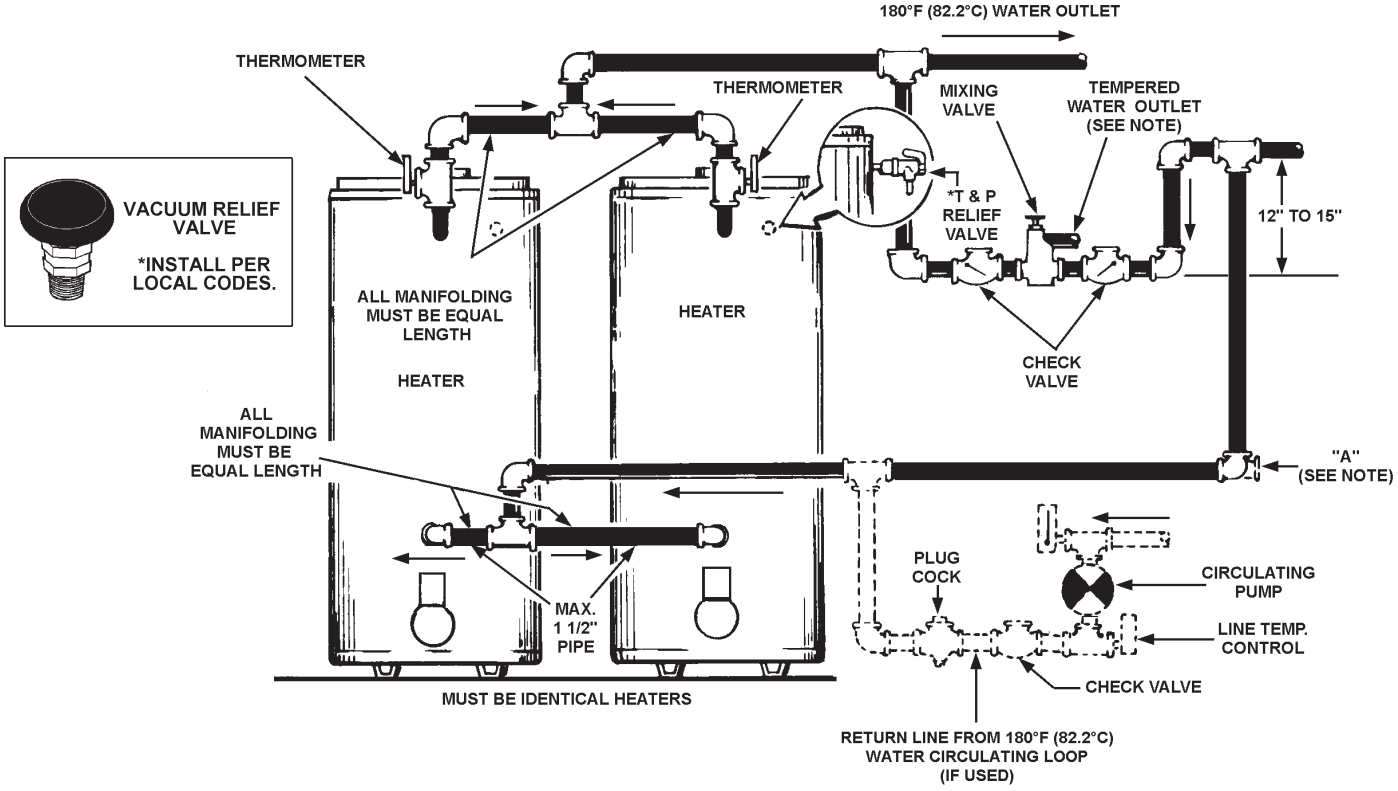
WIRING DIAGRAM FOR TEMPERED WATER LOOP (IF USED)

CIRCULATING PUMP WIRING DIAGRAM



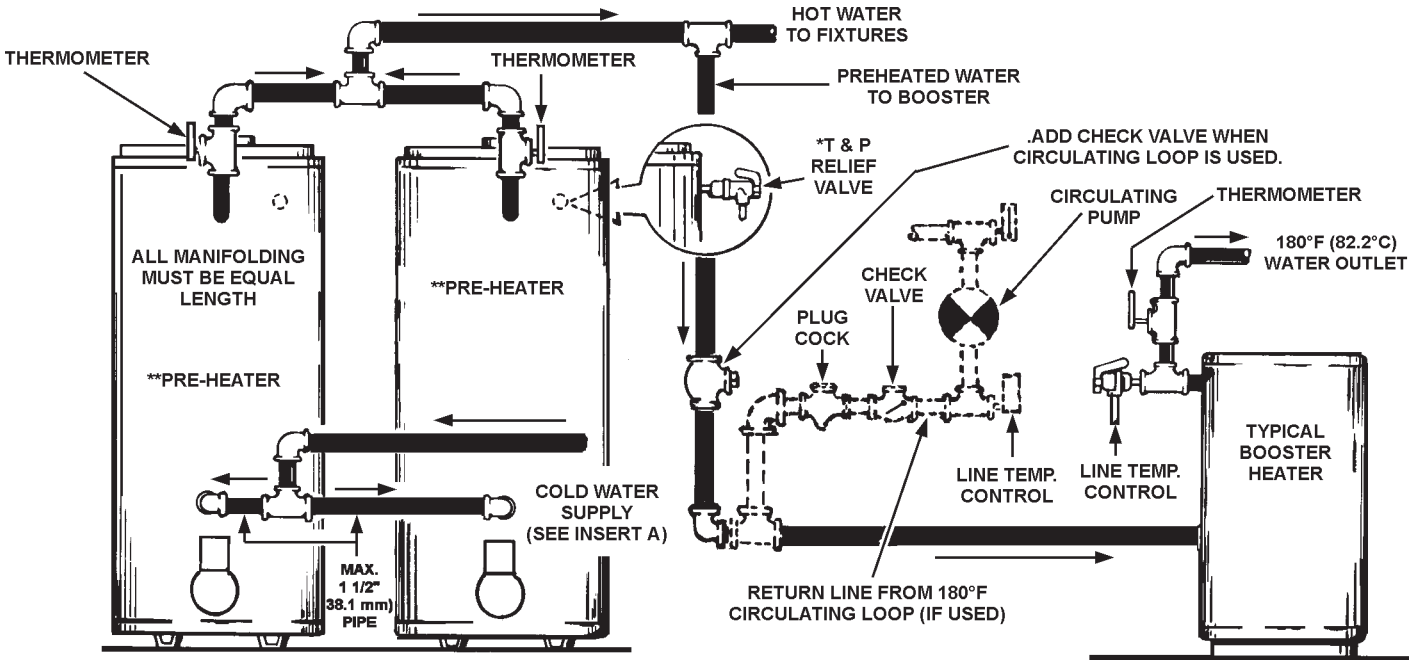


TWO TEMPERATURE - TWO HEATERS HIGH TEMPERATURE WITH OR WITHOUT BUILDING RECIRCULATION



Downloaded from www.Manualslib.com manuals search engine

TWO TEMPERATURE - THREE HEATERS (TWO PRE-HEATERS/ONE BOOSTER) WITH OR WITHOUT BUILDING RECIRCULATION



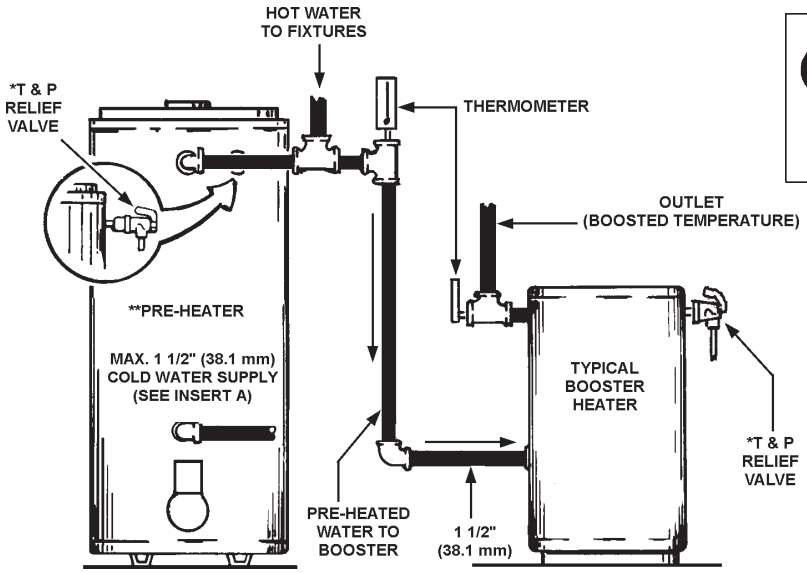
CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACKFLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

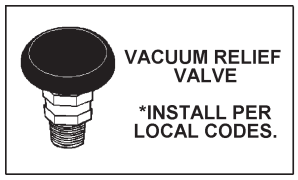
FOR MULTIPLE HEATER INSTALLATION SEE MANIFOLD KIT SPECIFICATIONS, PAGE 18.

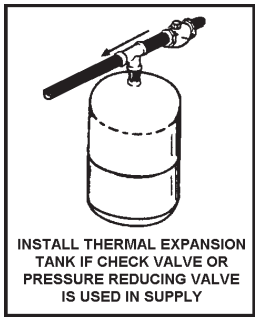
⚠ DANGER

TEMPERATURE SETTING SHOULD NOT EXCEED SAFE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGE 23. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES.

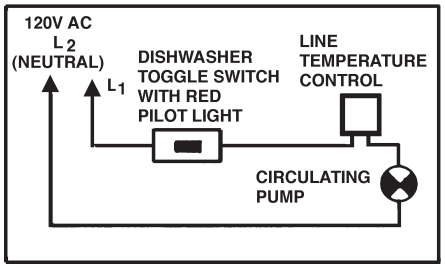
TWO TEMPERATURE - TWO HEATERS (ONE PRE-HEATER/ONE BOOSTER HEATER) WITH OR WITHOUT BUILDING RECIRCULATION


HOT WATER TO FIXTURES
*T & P RELIEF VALVE
THERMOMETER
OUTLET (BOOSTED TEMPERATURE)
**PRE-HEATER
MAX. 1 1/2" (38.1 mm) COLD WATER SUPPLY (SEE INSERT A)
TYPICAL BOOSTER HEATER
*T & P RELIEF VALVE
PRE-HEATED WATER TO BOOSTER
1 1/2" (38.1 mm)





WIRING DIAGRAM FOR 180°F LOOP (IF USED)



* PIPE RELIEF VALVE TO OPEN DRAIN.

** 140°F TO 150°F SHOULD BE MAXIMUM WATER TEMPERATURE MAINTAINED IN THE PRE-HEATERS.

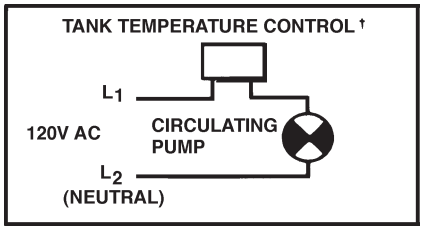
120°F SHOULD BE THE MINIMUM TEMPERATURE OF WATER IN THE PRE-HEATERS.

CONNECT CIRCULATING LINE FROM FIXTURES, IF USED, TO COLD WATER SUPPLY LINE OF PRE-HEATER.

CONNECT CIRCULATING LINE OF 180°F OR BOOSTED WATER, IF USED, TO INLET WATER LINE TO BOOSTER.

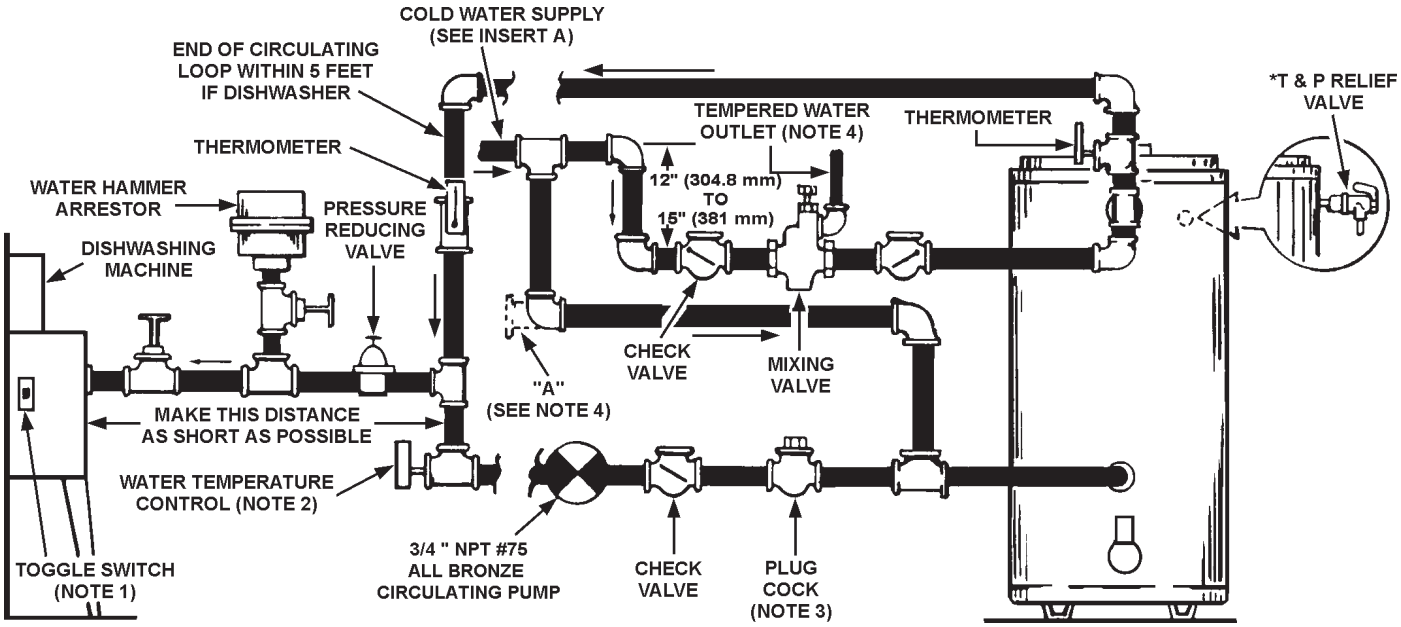
INSTALL IN ACCORDANCE WITH LOCAL CODES.

CIRCULATING PUMP WIRING DIAGRAM



Downloaded from www.Manualslib.com manuals search engine

TWO TEMPERATURE - ONE HEATER HIGH TEMPERATURE WITH RECIRCULATION OF SANITIZING LOOP



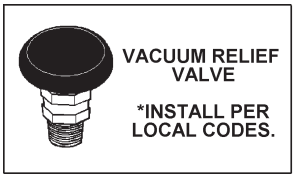
DANGER

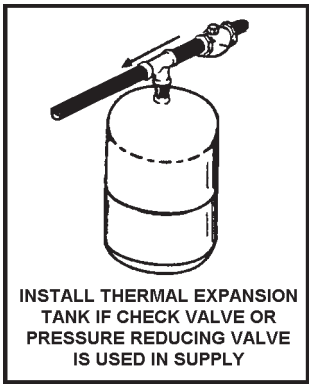
TEMPERATURE SETTING SHOULD NOT EXCEED SAFE TEMPERATURE AT FIXTURES. SEE WATER TEMPERATURE CONTROL WARNING ON PAGE 23. IF HIGHER PREHEAT TEMPERATURES ARE NECESSARY TO OBTAIN ADEQUATE BOOSTER OUTPUT, ADD AN ANTI-SCALD VALVE FOR HOT WATER SUPPLIED TO FIXTURES.

CAUTION: IF BUILDING COLD WATER SUPPLY HAS A BACKFLOW PREVENTER, CHECK VALVE OR WATER METER WITH CHECK VALVE, PROVISIONS FOR THERMAL EXPANSION OF WATER IN THE HOT WATER SYSTEM MUST BE PROVIDED.

*PIPE TO OPEN DRAIN

INSTALL IN ACCORDANCE WITH LOCAL CODES





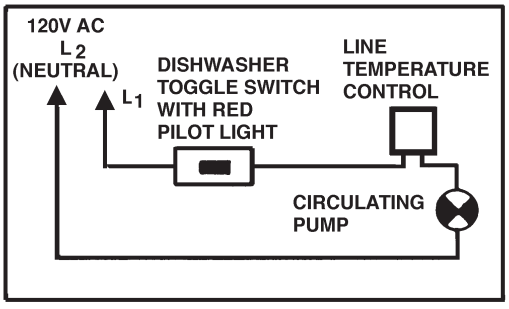
NOTE 1: TOGGLE SWITCH CONTROLS 180° WATER CIRCULATION. INSTALL ON OR CLOSE TO DISHWASHING MACHINE. TOGGLE SWITCH MUST BE CLOSED (ON) DURING THE RINSE OPERATION AND OPEN (OFF) WHEN DISHWASHER IS NOT OPERATING OR WHEN ON LONG STANDBY.

NOTE 2: INSTALL LINE TEMPERATURE CONTROL IN AN UNINSULATED TEE BEYOND THE DISHWASHING MACHINE TAKEOFF IN THE SANITIZING LOOP. CONTROL SHOULD BE SET AT 185°F.

NOTE 3: ADJUST PLUG COCK SO THE SANITIZING LOOP FLOW RATE DOES NOT CAUSE UNNECESSARY TURBULENCE IN THE TANK.

NOTE 4: IF TEMPERED WATER IS RECIRCULATED, RETURN LINE SHOULD BE CONNECTED AT POINT "'A".

WIRING DIAGRAM FOR 180°F LOOP (IF USED)



Downloaded from www.Manualslib.com manuals search engine

MANIFOLD KITS

Precision cut type “L” all copper A. O. Smith manifold kits assure water flow balance of all units. Without this balance, the full water heating and storage potential of the system cannot be achieved. Plus, the units with the higher water flow may have a shortened life. Unions shown in piping diagrams are not included in the manifold kits.

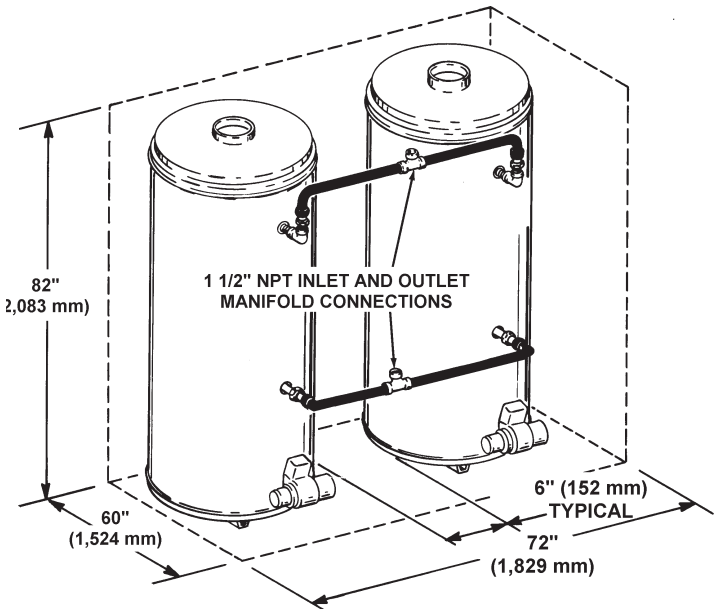
Dimensions shown are for minimum space occupied by the water heaters assemblies.

Space for the barometric draft control assemblies, combustion clearances and servicing must be added.

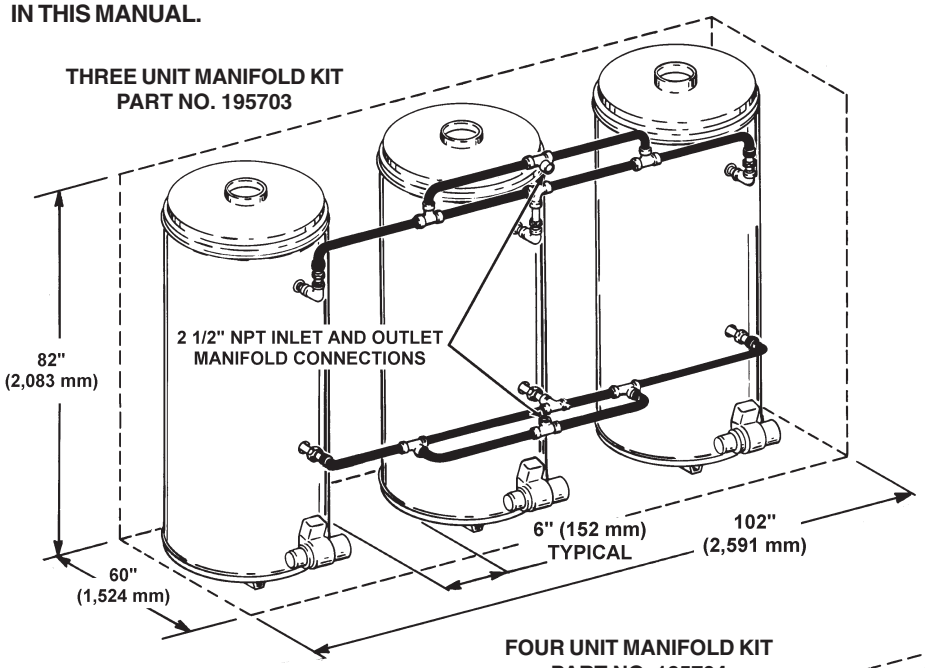
⚠ WARNING

FAILURE TO PROPERLY MANIFOLD MULTIPLE WATER HEATERS AND PROVIDE ADEQUATE STORAGE CAPACITY IN ACCORDANCE WITH PROPER SIZING TECHNIQUES CAN RESULT IN IMPROPER OPERATION AND POSSIBLE FIRE RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH. HEATERS SHOULD BE MANIFOLDED IN PARALLEL FOR UNIFORM HYDRONIC LOADING PER THE DIAGRAMS SHOWN IN THIS MANUAL.

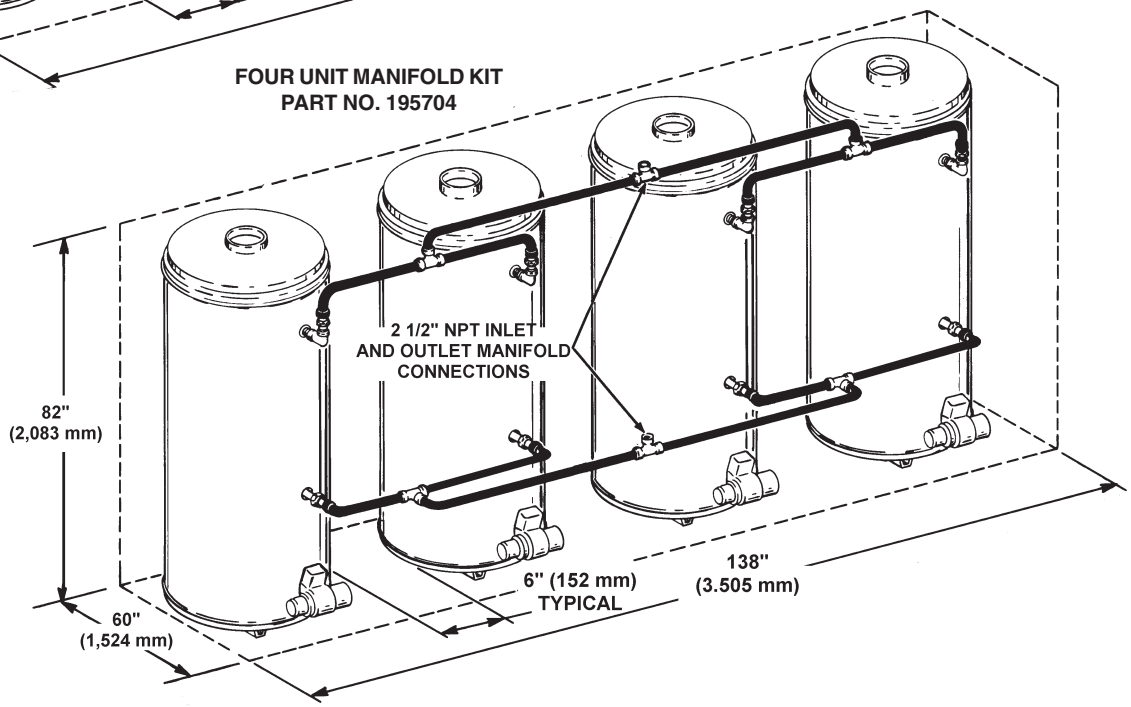
TWO UNIT MANIFOLD KIT
PART NO. 195702



THREE UNIT MANIFOLD KIT
PART NO. 195703



FOUR UNIT MANIFOLD KIT
PART NO. 195704



Downloaded from www.Manualslib.com manuals search engine

HEATER WIRING

IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH 105°C WIRE OR ITS EQUIVALENT, EXCEPT IN THE BURNER HOUSING USE 200°C WIRE.

The power burner is wired to the heater as shown in Figure 11 for BTP models and Figure 12 for BTPV models. The model and rating plate provided the electrical information needed to size the complete heater branch supply.

All electrical work must be installed in accordance with the National Electrical Code and local requirements.

When installed, the appliance must be electrically grounded in accordance with local codes or, in the absence of local codes, with the National Electrical Code, ANSI/NFPA 70-1987.

DO NOT ENERGIZE THE BRANCH CIRCUIT BEFORE THE HEATER TANK IS FILLED WITH WATER.

START UP

IMPORTANT

AUTHORIZED START-UP REQUIRED. Start-up by an A.O. Smith Authorized BTP Start-Up Agent is required on the model covered by this manual. Start-up and Operation of this unit by other than an Authorized BTP Start-Up Agent will void the warranty.

If you have not already done so, contact your local A.O. Smith Sales Representative or Authorized BTP Start-Up Agent and set-up a date for the start-up service.

The time to ask any questions you may have about your unit is when the A.O. Smith Authorized BTP Start-Up Agent is there. Please do not hesitate to ask the agent any questions which you may have regarding the units start-up, operation or maintenance.

⚠ CAUTION

BEFORE PROCEEDING WITH THE OPERATION OF THE UNIT, MAKE SURE HEATER AND SYSTEM ARE FILLED WITH WATER AND ALL AIR IS EXPELLED FROM HEATER AND PIPING.

NEVER OPERATE THE HEATER WITHOUT FIRST BEING CERTAIN IT IS FILLED WITH WATER AND A TEMPERATURE AND PRESSURE RELIEF VALVE IS INSTALLED IN THE RELIEF VALVE OPENING OF THE HEATER.

FILLING

1. Close the heater drain valve by turning handle clockwise.
2. Open a nearby hot water faucet to permit the air in the system to escape.
3. Fully open the cold water inlet pipe valve allowing the heater and piping to be filled.
4. Close the hot water faucet as water starts to flow.
5. The heater is ready to be operated.

PURGING

Gas line purging is required with new piping or systems in which air has entered.

⚠ CAUTION

PURGING SHOULD BE PERFORMED BY PERSONS EXPERIENCED IN THIS TYPE GAS SERVICE. TO AVOID RISK OR FIRE OR EXPLOSION, PURGE DISCHARGE MUST NOT ENTER CONFINED AREA OR SPACES WHERE IGNITION CAN OCCUR. THE AREA MUST BE WELL VENTILATED AND ALL SOURCES OF IGNITION MUST BE INACTIVATED OR REMOVED.

The following test equipment should be on hand: (all test equipment must be acclimated to ambient temperature before calibration and use.)

– CO_2 indicator (Fyrite or similar) or O_2 analyzer

– CO indicator (Monoxor or similar)

– Stack thermometer

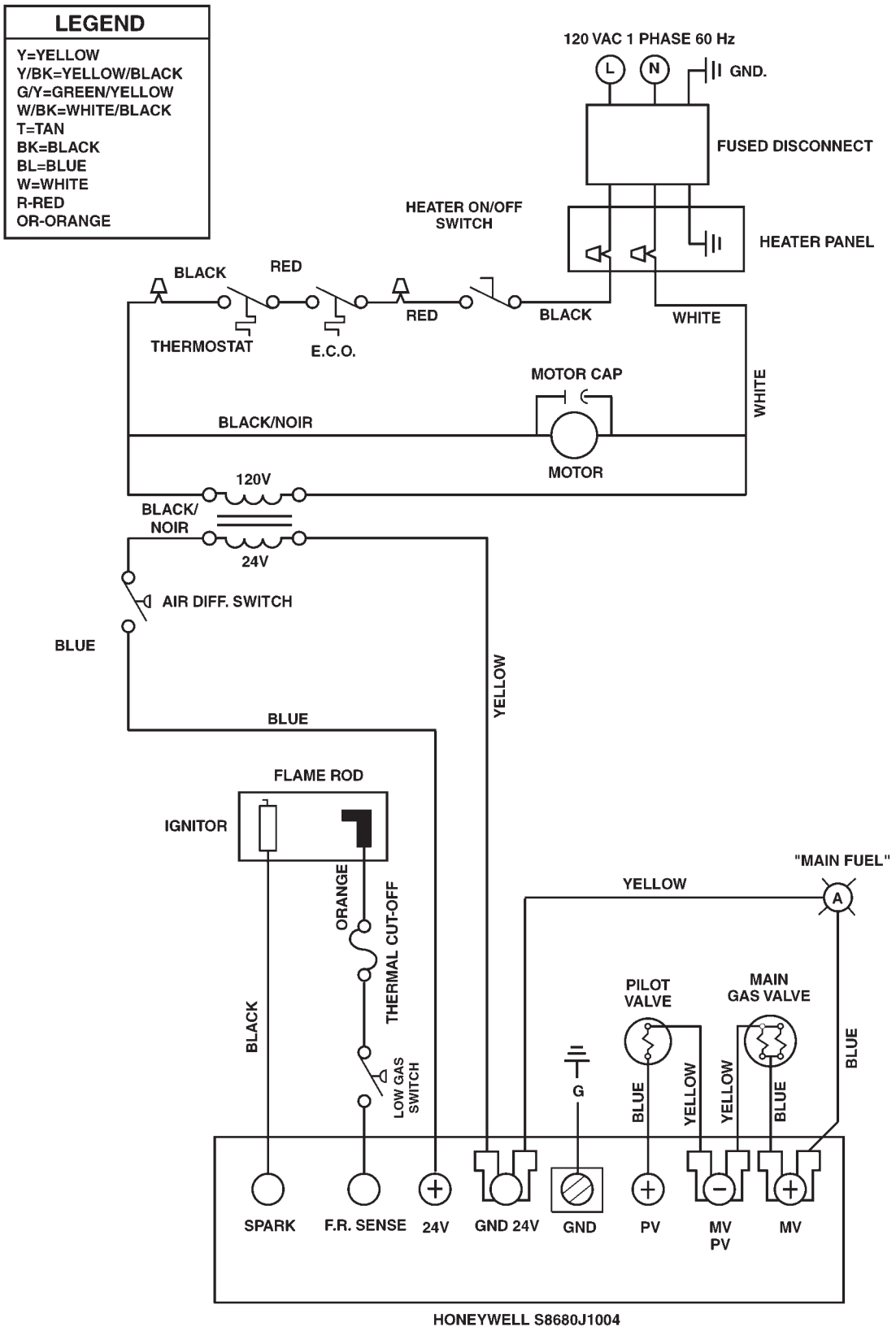
– Draft Gauge or inlined manometer

– Two U-Tube manometers or calibrated 0-10” and 0-35” w.c. pressure gauges

– Combination volt/ammeter

- Attach a gas pressure gauge or manometer to upstream side of main gas cock and a gas pressure gauge or manometer to the manifold pressure tapping.
- Check voltage at disconnect switch to make certain that it matches that shown on the burner label.
- Apply a few drops of No. 20 SAE non-detergent oil to motor bearings.
- Drill max. 5/16” hole in breeching as close as possible to flue connection on heater to install stack thermometer and combustion analyzing equipment, see Figure 4.
- You are now ready to begin the burner start-up procedure.

Downloaded from www.Manualslib.com manuals search engine



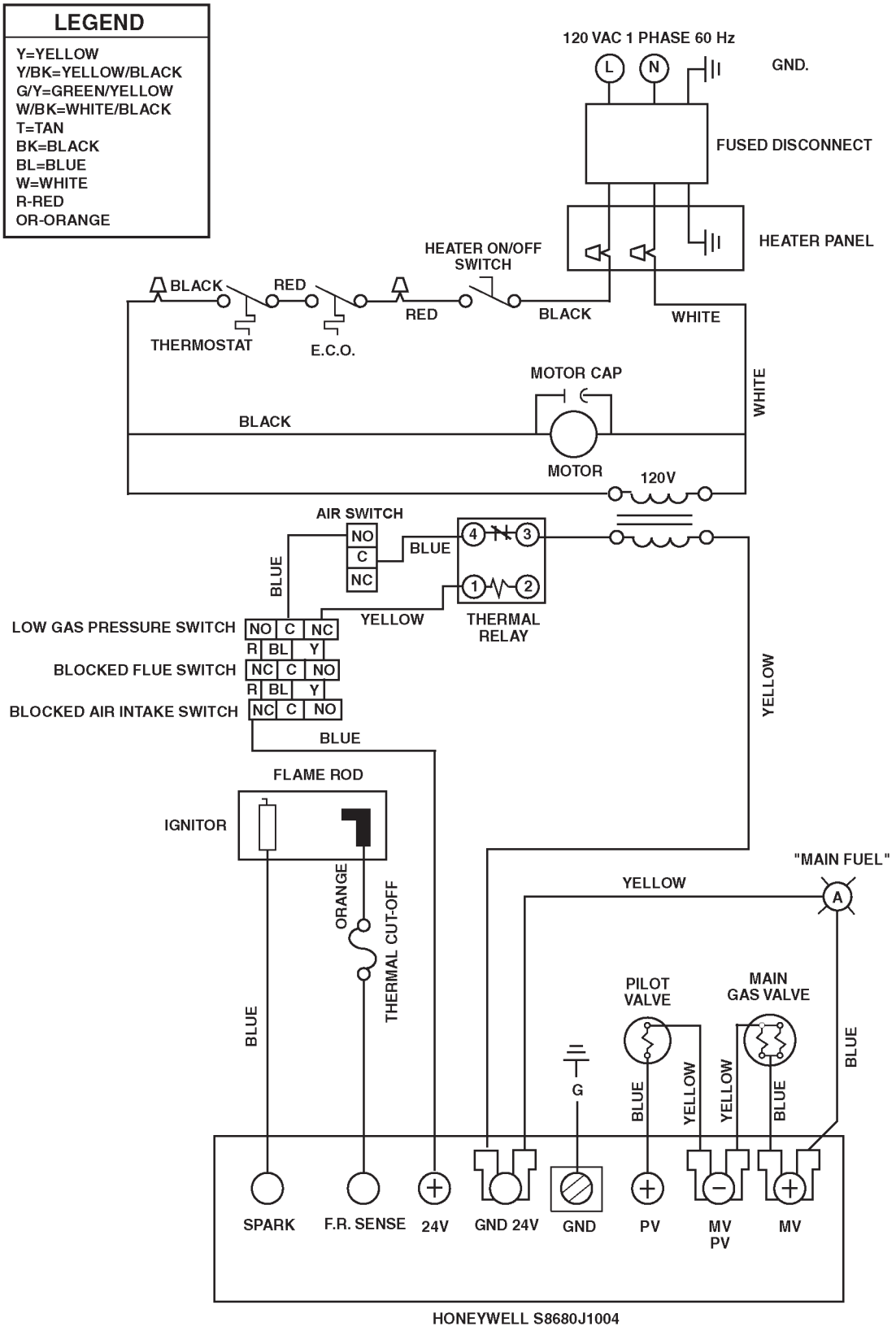
HONEYWELL S8680J1004

WIRING DIAGRAM FOR COMMERCIAL LOWNOX WATER HEATER FROM BAROMETRIC VENT

IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THIS APPLIANCE REQUIRES REPLACEMENT, IT MUST BE REPLACED WITH TYPE 105˚ C THERMOPLASTIC OR EQUIVALENT, EXCEPT IN BURNER HOUSING USE 200˚ C WIRE.

FIGURE 11.

Downloaded from www.Manualslib.com manuals search engine



HONEYWELL S8680J1004

WIRING DIAGRAM FOR COMMERCIAL LOWNOX WATER HEATER FOR HORIZONTAL & DIRECT VENT

IF ANY OF THE ORIGINAL WIRE AS SUPPLIED WITH THIS APPLIANCE REQUIRES REPLACEMENT, IT MUST BE REPLACED WITH TYPE 105° C THERMOPLASTIC OR EQUIVALENT, EXCEPT IN BURNER HOUSING USE 200° C WIRE.

FIGURE 12.

Downloaded from www.Manualslib.com manuals search engine

FOR YOUR SAFETY READ BEFORE LIGHTING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

FLAMMABLE

BEFORE OPERATING: ENTIRE SYSTEM MUST BE FILLED WITH WATER AND AIR PURGED FROM ALL LINES.

A. This appliance is equipped with an ignition device which automatically lights the burner.
Do NOT try to light burner by hand.

B. BEFORE LIGHTING: Smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:
- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

E. Do not operate appliance unless unit is filled with water and inlet lines are fully open.

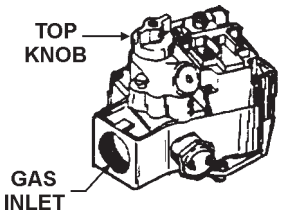
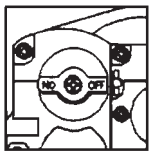
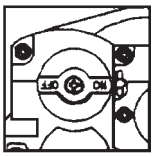


FIGURE "A"



"OFF POSITION"

FIGURE "B"



"ON POSITION"

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label.
2. Remove appliance thermostat cover. Rotate thermostat dial counterclockwise to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped an ignition device which automatically lights the burner. Do NOT try to light the burner by hand.
5. Refer to diagrams above. Turn top knob of gas control clockwise to "OFF" position (Figure A).
6. Wait five (5) minutes to clear out any gas. If you then smell gas,

   STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
7. Turn top knob of gas control counterclockwise to "ON" (Figure B).
8. Turn on all electric power to the appliance.
9. Set thermostat to desired setting.
10. Turn switch to "ON" position.
11. Heater will automatically begin operation. Blower motor will run approximately 40 seconds, then pilot gas valve will open. Upon confirming the pilot flame the main gas valve will open and the heater will operate in heating mode. Reference "Sequence of Operation" section of manual for details.
12. Heater is equipped with an ignition module which locks out after one (1) unsuccessful ignition attempt. Blower motor will continue to run. If lockout occurs, turn burner switch to "OFF" position for at least one minute, then turn the switch back to "ON". Heater will automatically begin operation.
13. Replace thermostat control cover.
14. If the appliance will not operate, follow the instructions "TO TURN OFF GAS APPLIANCE" and call your service technician or gas supplier.

TO TURN OFF GAS TO APPLIANCE

1. Remove thermostat control cover.
2. Set thermostat to lowest setting.
3. Turn burner switch to "OFF".
4. Turn off all electric power to the appliance if service is to be performed.
5. Turn top knob of gas control to the "OFF" position. Refer to Step 5 of 'OPERATING INSTRUCTION" above.
6. Replace thermostat control cover.

Downloaded from www.Manualslib.com manuals search engine

SEQUENCE OF OPERATION

- Power on.
- Heater in standby mode.
- Thermostat calls for heat.
- Blower motor starts.
- Blower operation closes the normally open blower prover/ blocked outlet safety pressure switch.
- On proof of airflow, Honeywell S8680J flame control module energized.
- 45 seconds prepurge cycle begins.
- Following prepurge cycle, the pilot gas valve is energized.
- At the same time, the electronic spark generator in the module produces a high voltage spark pulse output.
- The voltage generates a spark at the ignitor that lights the pilot.
- If the pilot does not light (or flame signal is less than 1 micro A) within 15 seconds system locks out and must be reset by turning burner switch “OFF” for a minimum of 1 minute. During system lockout, blower still runs.
- When the pilot flame is established (flame is sensed by flame rod), the main gas valve is energized.
- Main gas flows to main burner where it’s ignited by the pilot flame. Now heater is in Heating Mode.
- During the Heating Mode:

  If gas line pressure drops below the setting point, the flame module is de-energized, gas valves closed, blower still runs.

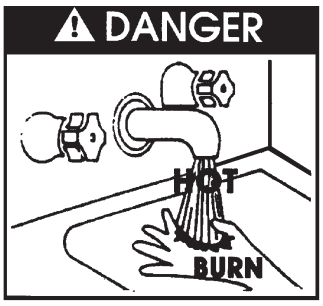
  If gas line pressure drops below the setting point then gas line pressure increases to above the setpoint, heater starts again from purging cycle.

  If gas line pressure fluctuates around the setpoint too quick (less than a second) burner may still run with excessive gas valve ON/OFF cycle you must turn off the unit immediately, re-adjust the gas line regulator and/or install a larger gas supply line!

  If the blower inlet and/or intake hood, or flue outlet/hood is/ are blocked for any reason, the safety switches will open, which will de-energize the flame control module.

- The spark generator is off.
- The flame module monitors pilot flame current. Should the flame failure occur during the Heating Mode, the unit will start again from purging cycle.
- Thermostat is satisfied, switch opens.
- Power is interrupted to the flame control module and blower motor. Gas valves are closed.
- Heater is in Standby Mode.
- Thermostat is satisfied, switch opens.
- Power is interrupted to burner, turning off blower and ignition control module. Solenoid and main gas valves are closed.
- Insufficient blower pressure causes safety pressure switches to open.

WATER TEMPERATURE CONTROL



⚠ DANGER

THIS WATER HEATER IS EQUIPPED WITH AN ADJUSTABLE THERMOSTAT TO CONTROL WATER TEMPERATURE. HOT WATER TEMPERATURES REQUIRED FOR AUTOMATIC DISHWASHER AND LAUNDRY USE CAN CAUSE SCALD BURNS RESULTING IN SERIOUS PERSONAL INJURY AND/OR DEATH. THE TEMPERATURE AT WHICH INJURY OCCURS VARIES WITH THE PERSON'S AGE AND TIME OF EXPOSURE. THE SLOWER RESPONSE TIME OF CHILDREN, AGED OR DISABLED PERSONS INCREASES THE HAZARDS TO THEM. NEVER ALLOW SMALL CHILDREN TO USE A HOT WATER TAP, OR TO DRAW THEIR OWN BATH WATER. NEVER LEAVE A CHILD OR DISABLED PERSON UNATTENDED IN A BATHTUB OR SHOWER.

THE WATER HEATER SHOULD BE LOCATED IN AN AREA WHERE THE GENERAL PUBLIC DOES NOT HAVE ACCESS TO SET TEMPERATURES.

SETTING THE WATER HEATER TEMPERATURE AT 120°F (49°C) WILL REDUCE THE RISK OF SCALDS. Some states or provinces require settings at specific lower temperatures.

Below you will find listed the approximate time-to-burn relationship for normal adult skin. Short repeated heating cycles caused by small hot water uses can cause temperatures at the point of use to exceed the thermostat setting by up to 20F°. If you experience this type of use, you should consider using lower temperature settings to reduce scald hazards.

Temperature Setting	Time to Produce 2nd & 3rd Degree Burns on Adult Skin
180°F (82°C)	Nearly instantaneous
170°F (77°C)	Nearly instantaneous
160°F (71°C)	About 1/2 second
150°F (66°C)	About 1-1/2 seconds
140°F (60°C)	Less than 5 seconds
130°F (54°C)	About 30 seconds
120°F (49°C)	More than 5 minutes

Valves for reducing point-of-use temperature by mixing cold and hot water are available. Also available are inexpensive devices that attach to faucets to limit hot water temperatures. Contact a licensed plumber or the local plumbing authority.

The water temperature is controlled by a thermostat, fig. 2, which has two sensing elements. One sensor is located near the top of the tank and the other is near the center. The thermostat is set in the lowest position before the heater leaves the factory.

The dial is adjustable and may be set for 120^0 (49°C) to 180^0F (82°C) water temperature, but 120^0F (49°C) is the recommended starting point. It is suggested the dial be placed on the lowest setting which produces an acceptable hot water supply. This will always give the most energy efficient operation. The temperature control has a 4F° fixed differential.

ADJUSTMENT PROCEDURE (Initial Start-Up)

A minimum dynamic gas supply pressure of 8” w.c. for natural gas is required before making any adjustment to the gas control pressure regulator. Attempts to adjust the regulator during periods of low gas supply pressure could result in overfiring of the heater when the gas supply pressure returns to normal.

Downloaded from www.Manualslib.com manuals search engine

1. Check gas line pressure with a manometer.

   Set initial gas line pressure at 9-10" w.c. before turning the heater "ON".

   Read gas line pressure and gas manifold pressure when the heater main gas is "ON".

   Adjust gas line regulator setting if the gas line pressure drops below 8" w.c. when heater main gas is "ON".

   Check heater gas manifold pressure (see Table 10) using a manometer connected to the manifold pressure tap on the Robertshaw gas control valve, see Figure 10.

Important Note: Use gas manifold pressure as initial setup only. The final air and gas settings should be based on fire rate and flue gas $0_2/C0_2$ reading, see Table 10 for normal $0_2/C0_2$ reading.

⚠ WARNING

Excessive gas line pressure drop and/or burner manifold pressure too low may cause burner start/operate with excessive noise!

2. Cycle the burner "ON" and "OFF" several times to check its operation. Make sure the gas line pressure is below 14" w.c. when burner is "OFF". If gas line pressure exceeds 14" w.c. when the burner is off, the gas supply line size must be increased to correct this problem (see Table 9 for gas pipe size).
3. Check the operation of the limiting and operating controls.
4. Check the vent system seams and joints and ensure that there is no discharge of flue products into the room. For standard vertical vent systems, check the barometric damper control to make sure it operates freely and there is no discharge of flue products into the room.
5. Check the input rate by clocking the gas meter.

ADJUSTMENT PROCEDURE FOR FIRE-RATE, LOW NOX AND HIGH ELEVATION (Fine-Tune)

An acceptable input rate is within 2% of the rated input for the model. Should it be necessary to adjust the gas pressure to the burner and/or air damper of the blower to obtain the full input rate, these steps should be followed:

⚠ WARNING

Never set burner combustion too lean (causing noisy operation) or too rich (causing combustion chamber premature failure) see Table 10 for proper settings.

⚠ WARNING

Never set air damper outside of its adjustment range of the rated fire rate unless authorized by an A.O. Smith Service Center.

Important Note: Final gas and air settings should be based on flue gas CO_2 or O_2 reading (see Table 10). Increase burner manifold pressure will increase fire rate and flue gas CO_2 reading. Increase air damper setting will decrease fire rate and decrease flue gas CO_2 reading. Adjustable air damper is preset for the rated fire-rate prior to delivery, should not be re-adjusted unless it's a high elevation application and/or a direct vent (long air intake vent) application.

1. Fire Rate Adjustment (including direct vent installation).

   a. Make sure the gas supply line pressure reads 8" w.c. (2 kPa) or higher when the heater is running.

   b. Remove the pressure regulator cover screw (Figure 10) and adjust the pressure by tuning the adjustment screw w/a small screwdriver clockwise to increase gas pressure into the burner and fire rate. Counterclockwise to decrease gas pressure and input rate.

   c. Clock gas meter, repeat above Step (b) to achieve the specific input rate.

   d. Measure flue gas O_2 and/or CO_2 (see Table 10) for acceptable O_2/CO_2 range.

      If the O_2 or CO_2 reading is within the acceptable range, then proceed to Step (f).

      If the O_2 or CO^2 reading is out of range, adjust air damper is required.

   e. Repeat Steps (b), (c), (d) if air damper is adjusted.

   f. Cycle heater ON/OFF.

   g. Replace the gas regulator cover, pressure tap and tighten the damper center bolt.

2. Adjustment for Low NOx Emission Application.

   The water heater is preset at factory for Low Nox emission combustion. Due to the installation variations, fine-tune adjustments may be required. To lower NOx emission level (30PPM corrected at 3% O_2 or lower is required by SCAQMD), air damper setting may need to be slightly increased. To increase air damper setting, loosen the center nut of the inlet air damper, rotate the damper clockwise slightly, then tighten the center nut. After re-set the air damper, cycle heater ON/OFF and check fire-rate and flue gas CO_2/O_2 reading.

3. Adjustment for High Elevation Application

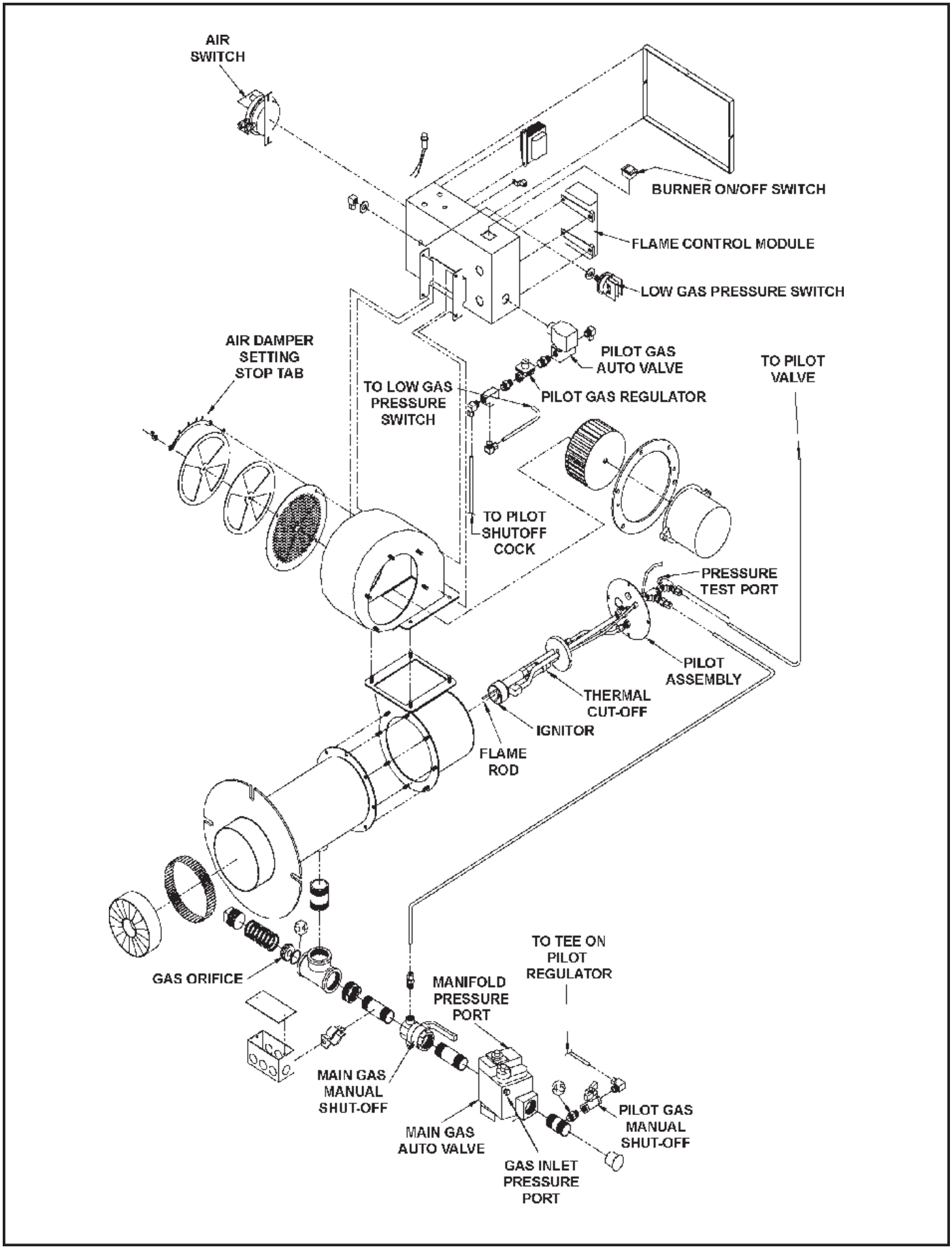
   Installation above 2000 feet sea level require new air damper settings. All the final settings should be based on flue gas CO_2/O_2 reading, see Table 10. To increase air damper setting, loosen the center bolt of the inlet air damper, rotate the damper clockwise slightly, then tighten the center bolt. After re-setting the air damper, cycle heater ON/OFF and check fire-rate and flue gas CO_2/O_2 reading.

⚠ WARNING

UNDER NO CIRCUMSTANCES SHOULD THE INPUT RATE EXCEED THE INPUT RATE SHOWN IN THE HEATER RATING PLATE. OVERFIRING COULD RESULT IN DAMAGE OR SOOTING OF THE HEATER.

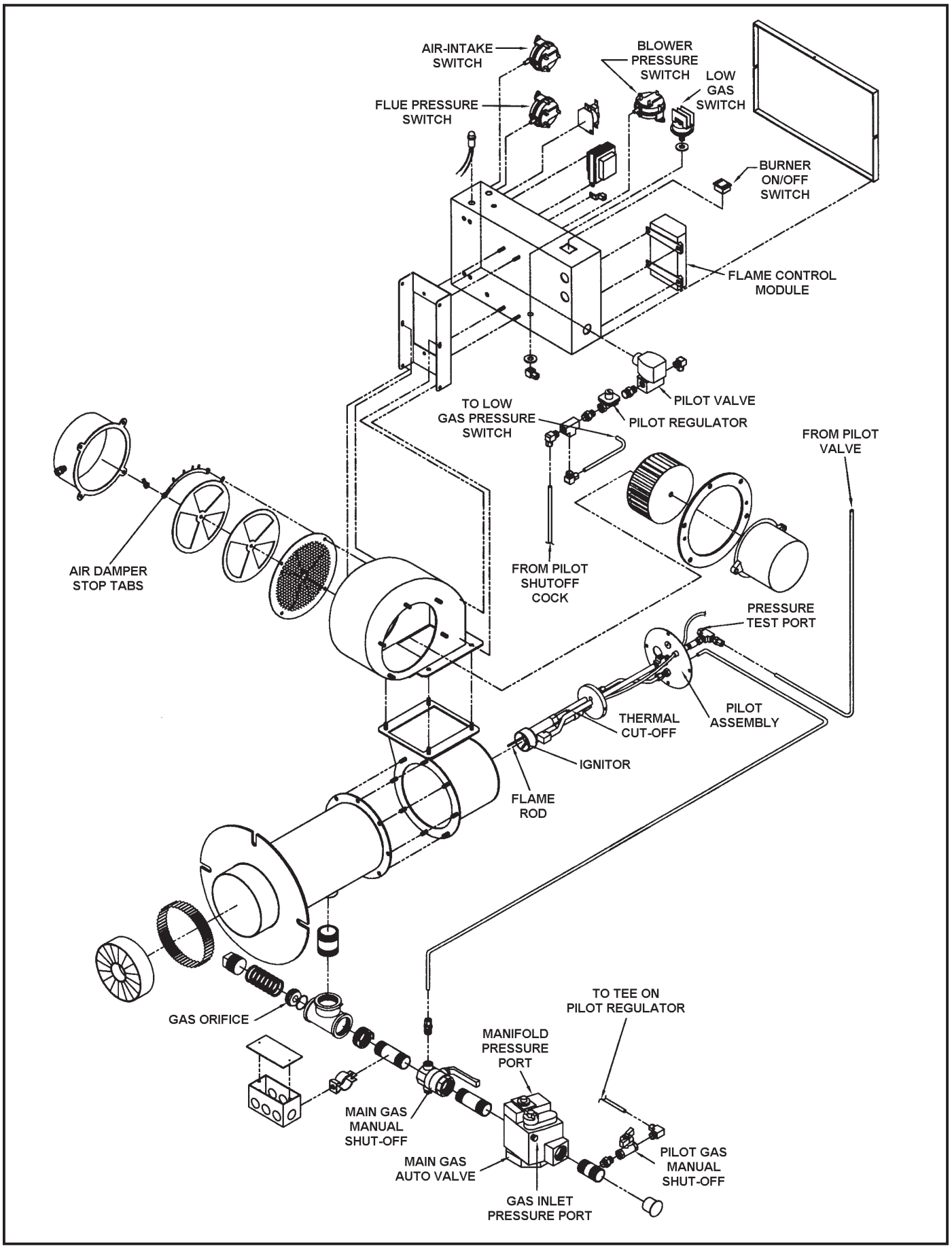
SHOULD OVERHEATING OCCUR OR THE GAS SUPPLY FAIL TO SHUT OFF, TURN OFF THE MANUAL GAS CONTROL VALVE TO THE APPLIANCE.

Downloaded from www.Manualslib.com manuals search engine



PREMIX LOW NOx BURNER - EXPLODED VIEW FOR BTP MODELS
FIGURE 13.

Downloaded from www.Manualslib.com manuals search engine



PREMIX LOW NOx BURNER - EXPLODED VIEW FOR BTPV MODELS
FIGURE 14.

Downloaded from www.Manualslib.com manuals search engine

GENERAL INFORMATION

POWER BURNER

The initial start-up procedure of the gas power burner is provided on page 18 thru 21. Refer to Figure 12, burner exploded view for burner components location.

The sequence of operation of the power burner is provided on page 15. For detailed Power Burner Operation, Maintenance and Troubleshooting refer to the separate Power Burner Manual provided with this water heater.

THERMOSTAT

It is suggested the thermostat be turned to the lowest setting, which satisfies the hot water requirements of the system. This helps minimize scale formation in the heater.

HIGH LIMIT

The high limit (not adjustable) is factory set to cutout at 205°F (96°C). The high limit switch must be manually reset by depressing the reset button on front of the control when water temperature drops to about 180°F (82°C).

GAS AND AIR SUPPLY SPECIFICATIONS TABLE 10

Model	BTP(V)-540A	BTP(V)-650A	BTP(V)-750A
Min. Dynamic Gas Supply Line Pressure	8" w.c. (2 kPa) When heater is ON		
Max. Static Gas Supply Line Pressure	14" w.c. (3.5 kPa) When heater is OFF		
Gas Manifold Pressure	4.7"w.c. (1.1 kPa) (Ref.)*	4.7"w.c. 1.1 kPa) (Ref.)*	4.7"w.c. (1.1 kPa) (Ref.)*
Gas Orifice Size	1/2"	11/16"	N/A
Air Inlet Damper Dial Setting	3**	4.5**	5.6**
Combustion Emissions Range	Flue Gas O2: 5 - 6.5%** (or CO2 reading 8 - 9%)		

* **Note:** Flue gas excess O_2 below 3% may cause combustion chamber premature failure; flue gas excess O_2 above 7% may cause rough operation or incomplete combustion. Final manifold pressure settings should be based on flue O_2/CO_2 reading!

** **Note**: Air inlet damper setting needs to be adjusted at field for direct vent and/or high elevation installations.

MAINTENANCE

GENERAL

KEEP APPLIANCE AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS. (SEE WARNING PAGE 6).

Water heater maintenance includes periodic tank flushing and cleaning, and removal of lime scale. The power burner should be inspected and adjusted to maintain proper combustion. Refer to the following table. A periodic inspection of the venting system should be made. Where used the water heating system circulating pump should be oiled.

MAINTENANCE SCHEDULE

Following are the instructions for performing some of the recommended maintenance. Power burner inspection and adjustment should be performed by a competent technician.

MAINTENANCE SCHEDULE

Component	Operation	Interval	Required
Tank	Sediment Removal	Monthly	Flushing
	Lime Scale Removal	Semi-Annually	UN-LIME® Delimer
Relief Valve	Inspect	Semi-Annually	
Circulating Pump(1)	Oiling	Four Months	SAE No. 20 non-detergent motor oil
Power Burner Blower	Clean Inlet Screen and Blower Wheel	As Required	Soft Brush
Power Burner and Ignition Device(2)	Inspection	Semi-Annually	
Barometric Damper	Inspect	Every 3 Months	Make sure gate swings freely, no spillage into room
Flue	Cleaning	As Required	Wire Brush
Vent System	Inspect	Every 3 Months	Joints should be sealed

(1) If furnished with oiling provisions.
(2) If flange gasket is damaged, it must be replaced.

ELECTRICAL SERVICING

⚠ CAUTION

LABEL ALL WIRES PRIOR TO DISCONNECTION WHEN SERVICING CONTROLS. WIRING ERRORS CAN CAUSE IMPROPER AND DANGEROUS OPERATION.

VERIFY PROPER OPERATION AFTER SERVICING.

FLUSHING

1. Turn off the heater electrical disconnect switch.
2. Open the drain valve and allow water to flow until it runs clean.
3. Close the drain valve when finished flushing.
4. Turn on the heater electrical disconnect switch.

Downloaded from www.Manualslib.com manuals search engine

DRAINING

The heater must be drained if it is to be shut down and exposed to freezing temperatures. Maintenance and service procedures may also require draining the heater.

1. Turn off the heater electrical disconnect switch.
2. Close the cold water inlet valve to heater.
3. Open a nearby hot water faucet to vent the system.
4. Open the heater drain valve.
5. If the heater is being drained for an extended shutdown, it is suggested the drain valve be left open this period.

   • Follow FILLING instructions when restoring hot water service.

SEDIMENT REMOVAL

Waterborne impurities consist of the particles of soil and sand which settle out and form a layer of sediment on the bottom of the tank.

For convenience, sediment removal and lime scale removal should be performed at the same time.

LIME SCALE REMOVAL

The amount of calcium carbonate (lime) released from water is in direct proportion to water temperature and usage. The higher the water temperature or water usage, the more lime deposits are dropped out of the water. This is the lime scale which forms in pipes, heaters and on cooking utensils.

Lime accumulation not only reduces the life of the equipment but also reduces efficiency of the heater and increases fuel consumption.

The usage of water softening equipment greatly reduces the hardness of the water. However, this equipment does not always remove all of the hardness (lime). For this reason it is recommended that a regular schedule for deliming be maintained.

The depth of lime build-up should be measured periodically. Heaters will have about 3" (76 mm) of lime build-up when the level of lime has reached the bottom of the cleanout opening or about 1" of lime build-up if it has reached the drain valve opening. A schedule for deliming should be set up; based on the amount of time it would take for a 1" (25.4 mm) build-up of lime.

Example 1 – Initial inspection shows 1/2" (12.7 mm) of lime accumulation. Therefore, the heater can be delimed once a year.

Example 2 – Initial inspection shows 2" (50.8 mm) of lime accumulation. Therefore, the heater should be delimed every 3 months.

Sediment and lime scale removal may be accomplished through the cleanout opening furnished on the heater, see FEATURES. The heater must be drained. See DRAINING, before removing cleanout cover on tank.

To dissolve and remove the more stubborn mineral deposits, A.O. Smith UN•LIME® Professional delimer should be used.

A.O. Smith UN•LIME® Delimer is an easy to handle patented food grade acid formulated specifically for lime scale removal from all types of water using equipment. Available in 1 gallon (part no. 4763) and 5 gallon (part no. 4813) sizes. Hydrochloric base acids are not recommended for use on glass-lined tanks.

A.O. Smith Form No. 4800 entitled "Why, When and How", describes tank cleaning methods and materials. UN•LIME® and the booklet may be obtained through your A.O. Smith dealer or distributor.

The cleanout opening is shown in Figure 9.

To clean heater through cleanout opening, proceed as follows:

1. Turn off water inlet valve, the heater electrical disconnect switch and open drain valve.
2. Remove outer cover plate from lower side of heater jacket.
3. Remove cover from cleanout opening.
4. Remove lime, scale or sediment using care not to damage the glass lining.
5. Inspect cleanout plate gasket; if new gasket is required, replace with A. O. Smith part no. 99038.
6. Install cleanout plate. Be sure to draw plate up tight by tightening screws securely.
7. Close drain valve, open water inlet line and turn on the burner electrical disconnect switch.
8. Check for water leakage.
9. Replace outer jacket cover plate.

RELIEF VALVE

At least twice a year, the temperature and pressure relief valve should be checked to ensure that it is in operating condition. To check the relief valve, lift the lever at the end of the valve several times. The valve should seat properly and operate freely.

⚠ CAUTION

BEFORE MANUALLY OPERATING A RELIEF VALVE, MAKE SURE THAT A DRAIN LINE HAS BEEN ATTACHED TO THE VALVE TO DIRECT THE DISCHARGE TO AN OPEN DRAIN. FAILURE TO TAKE THIS PRECAUTION COULD MEAN CONTACT WITH EXTREMELY HOT WATER, PASSING OUT OF THE VALVE, DURING THIS CHECKING OPERATION.

If the temperature and pressure relief valve on the heater discharges periodically or continuously, it may be due to thermal expansion of water in a closed water supply system, or, it may be due to faulty relief valve.

Thermal expansion is the normal response of water when it is heated. In a closed system, thermal expansion will cause the system pressure to build until the relief valve actuation pressure is equaled. Then, the relief valve will open, allowing some water to escape, slightly lowering the pressure.

Contact your water supplier or local plumbing inspector on how to control this situation.

Two common corrections are listed in the CHECKLIST AND SERVICE INFORMATION that appears later in this manual.

Downloaded from www.Manualslib.com manuals search engine

ABOVE ALL, DO NOT PLUG THE TEMPERATURE AND PRESSURE RELIEF VALVE. THIS IS NOT A SOLUTION AND CAN CREATE A HAZARDOUS SITUATION.

CIRCULATING PUMP

The water heating system may include a circulating pump. Where used, it should be lubricated as directed by the circulator manufacturer.

LOW EMISSION POWER BURNER

KEEP THE AREA AROUND THE BURNER CLEAR AND FREE OF COMBUSTIBLE MATERIALS, GASOLINE OR OTHER FLAMMABLE LIQUIDS OR VAPORS. DO NOT OBSTRUCT BURNER AIR OPENINGS OR VENTILATION GRILLES FOR COMBUSTION AIR. REMOVE LINT ACCUMULATION FROM AIR INTAKE GRILL.

The main burner flame should be visually checked once a year for proper operation. This can be observed through the "peep sight" port on the burner mounting plate. Burner flame should be kept blue.

At least annually, contact a qualified service agency for burner cleaning and other routine maintenance. For burner related Maintenance Schedule, Troubleshooting, Flame Rod, Ignitor, Thermal Cut-Off Switch Replacement Procedures, use burner Operation & Maintenance Manual provided with this heater.

CLEANING FLUES

The following describes how to gain access to the tank flues for cleaning if necessary.

1. Turn off the heater electrical disconnect switch.
2. Remove the vent connector from on top of the heater.
3. Remove the jacket top from the heater by taking out the screws and lifting it off.
4. Remove the insulation from the top of the heater.
5. Remove the inner cover by taking out the pipe collar around the water inlet and outlet nipple.
6. The flue baffles may now be removed by lifting out.
7. Using a wire brush, a nylon brush must not be used, remove soot from flue passages in heater tank.

⚠ CAUTION

While cleaning tank flue passages, care must be taken that brush does not come in contact with neither the combustion chamber lining nor the baffle or funnel which are an integral part of the combustion chamber, as damage could occur. The flue passages are 48-1/2" (1,232 mm) long x 3" (76.2 mm) diameter.

8. Upon completion of cleaning, return heater to operation by following this procedure in reverse.

BAROMETRIC DRAFT CONTROL - FOR BTP MODELS

The heater is equipped with a double acting barometric draft control as shown in Figure 15. The damper gate must pivot freely in the ring guides.

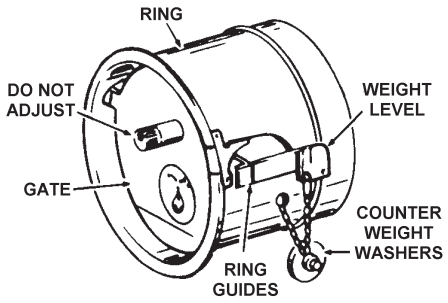


FIGURE 15

To test gate for operation, gently tap gate and observe. DO NOT OIL.

Adjust the number of counter-weight washers on the control to maintain a negative draft of 0.02" to 0.04" w.c. in the venting. See VERTICAL VENTING, page 8.

NOTE THAT THIS CONTROL WILL ONLY BE PRESENT IN A VERTICAL VENT INSTALLATION.

VENT SYSTEM

Examine the vent system every 3 months. Points of inspection are as follows:

1. Check for obstructions and/or deterioration of vent piping and vent hood. Replace immediately where needed.
2. Vent pipe and vent hood screen should be cleaned of foreign material and soot. The screen is located inside the vent hood outlet and is accessible from the outside of the hood. Do not reach inside the vent when the heater is in operation.
3. Check all vent system connections for leakage and re-seal as required using Hi Temp Silicone sealer or equivalent.

CHECKLIST AND SERVICE INFORMATION

IMPORTANT

The installer may be able to observe and correct certain problems which might arise when the unit is put into operation or when it is re-fired after a prolonged shutdown. HOWEVER, it is recommended that only qualified servicemen, using appropriate test equipment, be allowed to service the heater.

BE SURE TO TURN OFF THE ELECTRICITY WHENEVER POSSIBLE OR APPROPRIATE WHILE CHECKING EQUIPMENT.

BURNER OPERATIONAL PROBLEMS

1. Refer to TROUBLESHOOTING for comprehensive service information provided with both heater and burner manuals.

NOT ENOUGH OR NO HOT WATER

1. Be certain the electrical disconnect switch serving the water heater is in the ON position

Downloaded from www.Manualslib.com manuals search engine

2. Check the fuses.

   - The electrical disconnect switch usually contains fuses.

3. The capacity of the heater may have been exceeded by a large demand for hot water.

4. Colder incoming water temperature will lengthen the time required to heat water to the desired temperature.

   - If the heater was installed when incoming water temperature was warm, colder water creates the effect of less hot water.

5. Look for hot water wastage and leaking or open hot water faucets.

6. Sediment or lime scale may be affecting water heater operation. Refer to MAINTENANCE for details.

7. Heater or burner may be dirty.

   - Clean all heater flue pipes and flue connector, see MAINTENANCE.

   - Have burner properly cleaned and readjusted.

8. Burner may not be firing at proper rate.

   - Check gas pressure

9. Burner fan wheel may be dirty.

   - Clean fan wheel with a soft brush.

10. Reset button on high limit control (Figure 1) has operated. Press reset button.

WATER IS TOO HOT

1. Refer to WATER TEMPERATURE CONTROL.

WATER HEATER MAKES SOUNDS

1. Sediment or lime scale accumulation cause rumbling and pounding noises when the heater is operating.

   - The sounds are normal, however, the tank bottom should be cleaned. Refer to MAINTENANCE for details.

2. Some of the electrical components of the water heater make sounds which are normal.

   - Contacts click or snap as the heater starts and stops.

   - Transformers often hum.

WATER LEAKAGE IS SUSPECTED

1. Check to see if the water heater drain valve is tightly closed. Also check the cleanout opening for leakage.

2. The apparent leakage may be condensation that forms on cool surfaces of the heater and piping.

3. If the outlet of the relief valve is leaking it may represent:

   - Excessive water pressure

   - Excessive water temperature

   - Faulty relief valve

Excessive water pressure is the most common cause of relief valve leakage. It is often caused by a “closed system”. If a check valve, back flow preventer, or pressure-reducing valve is in the inlet system it will not permit the expanded hot water volume to equalize pressure with the main. The relief valve must release this water or the water heater or plumbing system will be damaged. Refer to MAINTENANCE – RELIEF VALVES.

When such a condition is encountered, local codes or inspection agency should be consulted to determine which system is acceptable in your area. These may consist of:

- Installation of a second relief valve with lower setting than the primary relief valve.

- An expansion tank of suitable size and pressure rating and provision to avoid water logging.

HOT WATER ODOR

On occasion, hot water may develop a strong odor. If this occurs, drain the heater completely, flush thoroughly, and refill. If the problem persists, chlorinating of the heater and replacement of the factory installed magnesium anodes with aluminum anodes may correct the condition.

Occasionally water softener companies recommend removal of heater anodes for odor reasons.

⚠ CAUTION

Unauthorized removal of the anode(s) will void the warranty. For further information contact your dealer.

TROUBLESHOOTING

⚠ WARNING

JUMPING OUT COMPONENTS AND/OR CIRCUITS DURING TROUBLESHOOTING CAN CAUSE SERIOUS PROBLEMS WITH THE POWER BURNER’S OPERATING SEQUENCE AND IGNITION SAFETY. IF YOU DO NOT HAVE THE PROPER TEST EQUIPMENT, I.E. A VOLT-OHM METER AND A MICRO-AMMETER DO NOT ATTEMPT TO TROUBLESHOOT OR REPAIR A.O. SMITH EQUIPMENT.

ALTERING THE IGNITION MODULE AND/OR CONTROL BOX WIRING IN ANY WAY COULD RESULT IN INTERNAL DAMAGE TO THE MODULE CIRCUITS, POSSIBLY ALTERING THE IGNITION SEQUENCE ALLOWING GAS VALVES TO OPEN BEFORE THE HOT SURFACE IGNITER IS UP TO IGNITION TEMPERATURE.

NOTE: ANY BYPASS OR ALTERATION OF THE UNITS SAFETIES WILL RESULT IN VOIDING THE APPLIANCE WARRANTY.

Before performing any troubleshooting familiarize yourself with the particular appliance. A. O. Smith power burners are supplied with Honeywell® ignition control systems and Robertshaw® gas control valves, see Figures 10 and 11.

®Honeywell is a registered trademark of Honeywell International Inc.

Downloaded from www.Manualslib.com manuals search engine

Refer to the SEQUENCE OF OPERATION and burner exploded view, see Figure 12 and the wiring diagram located on page 20, and the troubleshooting section of burner manual before continuing.

Make sure the appliance is connected to a 120 Vac power supply, burner switch is “ON” and manual gas valve is in the “ON” position, and all electrical connections are secure before continuing to troubleshoot this appliance.

MOTOR WILL NOT RUN

1. Confirm 120 Vac. Also, to verify correct polarity, check for 120 Vac between black wire and G.

   If there is no voltage, check for a loose connection or open switch at the high limit or thermostat.

2. If there is 120 volts between black wire and white wire, check for loose connections or a locked rotor. If the rotor cannot be freed the motor and blower assembly must be replaced.

BURNER LOCKOUT ONCE IN A WHILE

Under this condition, the burner operates properly for days, and burner lockout occurs once in a while. The root causes for the burner occasional lockout include: (1) Gas inlet pressure too low; (2) Condensation over the ignitor area; (3) the pilot flame is too weak to light the main flame reliably; (4) the pilot air/gas ratio is out of range causing pilot flame to be unreliable.

1. Turn burner switch to “OFF” position and turn off the main gas valve (Robertshaw®).

2. Install manometers for gas inlet pressure, manifold pressure, and pilot gas pressure, see Figure 12 for the pressure ports location).

3. Check for the gas inlet pressure, reset the service regulator (if required) to get 9” w.c. (2.2 kPa) - 10” w.c. (2.4 kPa) inlet pressure while the burner is in the “OFF” position.

4. Turn the burner “ON”,

   - Take blower pressure at the pressure port during the purge cycle, see Figure 12 for location.

   - Take the pilot gas pressure at the same pressure port during the ignition period (following 45 seconds purge cycle).

   - The pilot gas pressure should be 0.6” - 0.9” w.c. higher than blower pressure, if not, adjust the pilot gas regulator (during the ignition cycle, see Figure 12.

   - If burner lights on during the ignition cycle, cycle the unit on/off several times to ensure pilot system is reliable. Turn off the burner, then follow Step 6.

5. Turn the burner “OFF”, follow burner manual instructions to remove the pilot assembly (also refer to Figure 12 in this manual) and procedures to check pilot assembly. Items to check for the pilot system include:

   - Check for condensation over ignitor area.

   - Check for the ignitor gap (1/8” - 3/16”).

   - Check for the thermal cutoff continuity by ohm meter, replace it if the thermal cutoff is open.

   - Check for the low gas pressure switch by ohm meter (while pilot gas pressure is 7” w.c. [1.7 kPa] or higher).

   - Check for the continuity between the flame rod and sensor connection at Honeywell flame control module by the ohm meter.

   - Check for ignitor wire connections and spark leakage (call AOS service center for steps of spark leakage checking).

   - Following burner manual instructions to re-install the pilot assembly.

6. Turn on the Robertshaw gas valve, turn the burner switch to “ON” position. Cycle the heater ON/OFF several times to ensure the problem is solved.

MOTOR RUNS CONTINUOUSLY, PREPURGE TIME ELAPSES BUT MAIN FLAME NOT ESTABLISHED (BURNER LIGHT NEVER ON)

1. When the heater is first installed, gas line must be purged properly prior to start-up. This heater is equipped with a flame control module that only allows one “trial for ignition” for 15 seconds and locks out if no flame signal is detected. For initial start-up, two or more resets may be required to ensure that all the air has been purged from the gas pilot line. To reset the heater, turn the burner power switch to “OFF” position for at least one minute, then turn it back “ON”.

2. Check for gas supply line manual valves in “ON” position, and line pressure. Make sure the pilot manual gas cock (nearby the main gas valve) is fully open.

3. After the 45-seconds prepurge cycle, the pilot gas valve (mounted on the panel) “click” sound should be heard. If you hear the pilot gas energized, proceed to Step 5.

4. Check 24 Vac control circuit in the following systematic approach:

- Check for 24V between “24V” and “GND” of Honeywell Flame Control Module, which is located inside the burner control panel. If voltage is OK, proceed to Step 5.

- If there’s no voltage, check for 24V between the air switch “COM” terminal and GND (the air switch is mounted on the control panel, the switch cover needs to be removed to access the wiring terminal “COM” and “NO”). If there’s no 24 V, check for a loose connection between the 24V transformer and air switch, or a defective transformer.

- If there’s 24V at “COM” terminal, check for 24V between the air switch terminal “NO” (normally open) and GND. If there’s no 24V, the air switch pressure may be set too high or a defective air switch or loose connections of pressure sensing tubings. To lower the air switch setting, make sure the blower is running and blower wheel and air inlet are free from dirt, counterclockwise turn the switch setting-screw until the switch is closed. Call the A.O. Smith Technical Center before you reset the switch.

- If there’s 24V at “NO” terminal of the air switch, check for 24V at the air intake pressure switch connectors, (this switch is only supplied for direct vent systems). If there’s no 24V at the switch connectors, check for loose connections, air intake blockage, or a defective air switch.

Downloaded from www.Manualslib.com manuals search engine

- Do not proceed to Step 5 unless 24V is detected at “24V” terminal of the Honeywell Module.

5. As soon as the pilot gas valve is energized, check for the burner pilot flame through the burner peek-hole. If the pilot flame is established inside the burner, then proceed to Step 6.

- Turn the burner switch to “OFF” position for at least one minute to reset the heater.

- Check for 24V between “PV” terminal and “MV/PV” terminal after 45 seconds prepurge cycle (this 24V may only last 15 seconds starting after 45S prepurge). If there’s no 24V at the “PV” terminal ever, and there’s 24V at “24V” terminal, the Honeywell flame control module needs to be replaced.

- If 24V is detected for a period of 15 seconds, check for the changes of gas supply line pressure when the pilot gas valve is energized. If no visible pressure change during the pilot ignition period, check for loose connection of the pilot valve or a defective pilot gas valve.

- Adjust the pilot gas regulator setting during the pilot ignition period (15 seconds window). Do not set too much or too little pilot gas. This adjustment should only be performed during the 15 seconds ignition period. A clockwise or counter-clockwise 0.5 to 1 turn should be able to correct the problem. Refer to burner manual for detailed pilot gas setting procedure.

- If still no pilot flame inside the burner, check for the spark ignitor wiring, ignitor tip location and visually check the spark (burner pilot assembly needs to be taken out for the visual check). Refer to the burner manual for detailed spark ignition troubleshooting procedures.

6. Pilot flame established but not detected by the flame control module. Use Micro Amp meter to measure flame signal during the pilot ignition period. Refer to burner manual for testing procedures.

- If pilot flame is confirmed visually through the burner peek hole, and the flame signal is zero, the thermal-cutoff safety switch (mounted nearby the flame rod, inside the burner mixing chamber) may be broken or check for loose wire connections or low gas switch (mounted inside control panel) may be broken. If the thermal cutoff switch or low gas switch is broken (by checking the switch continuity), the switches must be replaced before the heater can operate again.

- If it’s confirmed that the thermal cutoff switch is damaged (open), call the A.O. Smith Technical Center to analyze the root cause (too lean combustion) and proper gas/air ratio adjustment. Flashback will cause the thermal cutoff switch broken (open).

- If the flame signal is not zero but below 1μA, relocate flame rod or replace flame rod will be required. Refer to burner manual for detailed procedure of replacing flame rod.

MOTOR RUNS CONTINUOUSLY, BURNER LIGHTS ON MOMENTARILY THEN LOCKS OUT OR EXCESSIVE ON/OFF CYCLE

Under this condition, the burner will start the purge cycle again, then pilot ignition and main flame cycle. If main flame cannot be sustained:

1. Make sure main manual gas valve (right after the Robertshaw gas valve) is fully open;

2. Check for 24V at the Robertshaw gas valve when the main gas light is on. If there’s no 24V at the valve, check loose wire connection.

3. Check for gas supply line pressure. The gas line pressure before the valve should be maintained at minimum 8” w.c. when main flame is “ON”. If the gas line pressure drops below 8” w.c. (2 kPa), the service regulator pressure setting must be increased to keep 8” w.c. (2 kPa) minimum gas pressure. After adjusting the gas regulator setting, turn off the heater, make sure the gas line pressure does not exceed 14” w.c. (3.5 kPa) if it does exceed 14” w.c. (3.5 kPa) static pressure, the gas supply line size must be increased accordingly to avoid gas line pressure exceeding 14” w.c. (3.5 kPa)

4. Check the gas valve manifold pressure (refer to Table 10), see ADJUSTMENT PROCEDURE to adjust the manifold pressure.

5. Check for defective gas valve for failing to open or shut off.

6. Verify that the air supply is adequate. The air inlet screen or blower wheel may be restricted.

7. Check the installation for proper ventilation, see AIR REQUIREMENTS.

8. Verify the air switch setting is not too high.

9. Check the venting system for the correct sizing, excessive or insufficient draft, and proper operation of the barometric draft control, see VENTING.

NOISY BURNER OPERATION

1. Check for flue gas excess O_2 or CO_2 reading (refer to Table 10). If combustion is too lean (flue gas O_2 reads more than 7.5%), the combustion flame front may not be stable, which will cause noisy operation. See ADJUSTMENT.

2. Check the venting system for the correct sizing, excess or insufficient draft, and proper operation of the barometric draft control, see VENTING.

3. If the burner operation is still noisy, then remove the burner, examine the burner diffuser, blast-tube tip, anti-flashback corrugated tube, center mixing, refer to the burner manual for details.

GAS FAILS TO SHUT OFF

Check for defective gas valve or thermostat. If operation is incorrect, replace.

REPLACEMENT PARTS

Replacement parts may be ordered through A. O. Smith dealers, unauthorized servicers or distributors. Refer to the Yellow Pages for where to call or contact the A.O. Smith Water Products Company, 5621 W. 115th Street, Alsip, IL 60803, 1-800-433-2545 or visit our website at www.aosmithwaterheaters.com When ordering parts be sure to state the quantity, part number and description of the items including the complete model and serial number as it appears on the product. Refer to the parts list for more information.

Downloaded from www.Manualslib.com manuals search engine

Model BTP(V) Limited Warranty

A.O. Smith Corporation, the warrantor, extends the following LIMITED WARRANTY to the owner of this water heater.

1. **THE TANK**
   If the glass-lined tank in this water heater shall prove upon examination by the warrantor to have leaked due to the natural corrosion from potable water therein, during the first THREE years after installation, the warrantor will supply a complete new A.O. Smith water heater of equivalent size and current model. Some government agencies are requiring energy efficient standards for water heaters. In the event regulations prohibit sale of a model of equivalent size and construction, A.O. Smith will provide a model which complies with the regulations of your area, in which case the consumer will be charged the difference in price between the like replacement and the energy efficient model required. The warranty on the replacement water heater will be limited to the unexpired term of the original warranty.

2. **ALL OTHER PARTS**
   If within ONE year after initial installation of this water heater, any part or portion shall prove upon examination by the warrantor to be defective in material or workmanship, the warrantor will repair or replace such part or portion at its option.

3. **CONDITIONS AND EXCEPTIONS**
   This warranty shall supply only when the water heater is installed in accordance with local plumbing and building codes, ordinances and regulations, the printed instructions provided with it and good industry practices. In addition, a temperature and pressure relief valve, certified by A.G.A and approved by the American Society of Mechanical Engineers, must have been installed.
   a) This warranty shall apply only when the heater is used:
      (1) used at temperatures not exceeding the maximum calibrated setting of its thermostat;
      (2) used at water pressure not exceeding the working pressure shown on the heater;
      (3) filled with potable water, free to circulate at all times and with the tank free of damaging water sediment or scale deposits;
      (4) used in a non-corrosive and non-contaminated atmosphere;
      (5) used with factory approved anode(s) installed;
      (6) in its original installation location;
      (7) in the United States, its territories or possessions, and Canada;
      (8) sized in accordance with proper sizing techniques for commercial and/or residential water heaters;
      (9) bearing a rating plate which has not been altered, defaced or removed, except as required by the warrantor;
      (10) operated with properly installed dirt leg;
      (11) fired with the fuel for which it was factory built;
      (12) fired at the factory rated input;
   b) Any accident to the water heater, any misuse, abuse (including freezing) or alteration of it, any operation of it in a modified form, or any attempt to repair tank leaks will void this warranty.
   c) This warranty is voided if a device as a backflow prevention device (check valves etc.) is installed in the cold water supply the heater is connected to unless an effective method of controlling thermal expansion is also installed at the heater(s) and operational at all times. The relief valve installed on the heater is not an acceptable method.

4. **SERVICE AND REPAIR EXPENSES**
   Under the limited warranty the warrantor will provide only a replacement water heater or part thereof. The owner is responsible for all other costs. Such costs may include bat are not limited to:
   a) Labor charges for services removal, repair or reinstallation of the water heater or any component part;
   b) Shipping, delivery, handling, and administrative charges for forwarding the new heater or replacement part from the nearest distributor and returning the claimed defective heater or part to such distributor.
   c) All cost necessary or incidental for material and /or permits required for installation of the replaced heater or part.

5. **LIMITATIONS ON IMPLIED WARRANTIES**
   Implied warranties, including the warranty of merchantability imposed on the sale of this heater under state law are limited to one (1) year duration for the heater or any of its parts. Some states do not allow limitation on how long an implied warranty lasts, so the above limitation may not apply to you.

6. **CLAIM PROCEDURE**
   Any claim under the warranty should be initiated with the dealer who sold the heater, or with any other dealer handling the warrantor's products. If this is not practicable, the owner should contact:

   U.S. Customers
   A.O. Smith Corporation
   5621 W. 115th St.
   Alsip, IL 60803
   Telephone 1-800-323-2636

   Canadian Customers
   A.O. Smith Ent., LTD.
   P.O. Box 310-768 Erie Street
   Stratford, Ontario N5A 6T3
   Telephone: 519-271-5800

   a) The warrantor will only honor replacement with identical or similar water heater or parts thereof which are manufactured or distributed by the warrantor.
   b) Dealer replacements are made subject to in-warranty validation by warrantor.

7. **DISCLAIMERS**
   NO OTHER EXPRESS WARRANTY HAS BEEN OR WILL BE MADE IN BEHALF OF THE WARRANTOR WITH RESPECT TO THE MERCHANTABILITY OF THE HEATER OR THE INSTALLATION, OPERATION, REPAIR OR REPLACEMENT OF THE HEATER. THE WARRANTOR SHALL NOT BE RESPONSIBLE FOR WATER DAMAGE, LOSS OF USE OF THE UNIT, INCONVENIENCE, LOSS OR DAMAGE TO PERSONAL PROPERTY OR OTHER CONSEQUENTIAL DAMAGE. THE WARRANTOR SHALL NOT A LIABLE BY VIRTUE OF THIS WARRANTY OR OTHERWISE FOR DAMAGE TO ANY PERSONS OR PROPERTY, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTRACT OR IN TORT.

Fill in the warranty for your own reference. Keep it. Registration is not a condition of warranty. The model and serial number are found on the heater's rating plate.

Model No._____ Serial No. _____Date Installed_____

Dealer's Name _____

Dealer's Address _____Phone No._____

City and State_____Zip _____

KEEP THIS WARRANTY POSTED ADJACENT TO THE HEATER FOR FUTURE REFERENCE.

Downloaded from www.Manualslib.com manuals search engine

NOTES

Downloaded from www.Manualslib.com manuals search engine

NOTES

Downloaded from www.Manualslib.com manuals search engine

REPLACEMENT PARTS

A.O.SMITH
WATER PRODUCTS COMPANY

5621 W. 115TH STREET, ALSIP, IL 60803
Phone: 800-433-2545 Fax: 800-433-2515
www.aosmithwaterheaters.com E-Mail: parts@hotwater.com

Downloaded from www.Manualslib.com manuals search engine